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The view passed to `TBall::Draw()` is the same view that was added to the offscreen bitmap in the `TWindow`'s constructor, so the ball is being drawn offscreen. The window then gets the `TBitmapView` (described earlier) to blit the offscreen image onto the screen.

The code for handling the `BB_HIT_HOLE` message is in `TWindow::MessageReceived`:

```
void TWindow::MessageReceived(BMessage *msg)
{
  switch (msg->what) {
       case BB_HIT_HOLE:
       /*
        The ball is telling us that it just hit the
        hole.  So it should get sent to the partner.
       */
       BMessage *m = new BMessage(BB_BALL);
       fBall->Lock();
       m->AddPoint("speed", msg->FindPoint("speed"));
       m->AddFloat("rel_loc", msg->FindFloat("rel_loc"));
       fBall->Unlock();

       // send the 'ball' to our partner
       my_app->SendToPartner(m);

       // delete the ball from this window
       fBall->Quit();
       fBall = NULL;

       // redraw the window
       Update();
       break;
       ... // handling of other messages
   }
}
```

The window responds to the `BB_HIT_HOLE` message by sending the `BB_BALL` message to the partner application giving it the ball. It puts the necessary information into the message so that the partner can create the new ball in the correct position, with the correct speed and direction. Finally, the window deletes the ball.

That is how the BeBounce application works. Obvious improvements to BeBounce would be to support more than two applications, multiple windows within the same application, and multiple balls. Another useful addition would be a separate control window with some controls for things like ball speed. All of these enhancements are feasible given the design of the Be operating system. To support an arbitrary number of applications each application would maintain a list of partners, having a `BMessenger` object to each one. Multiple balls in a window could either communicate with one another (for hit testing purposes) directly or use the window object as the arbitrator.

Hopefully this sample application has provided a taste of developing an application for the BeBox. The next question is: How do Be applications get built?

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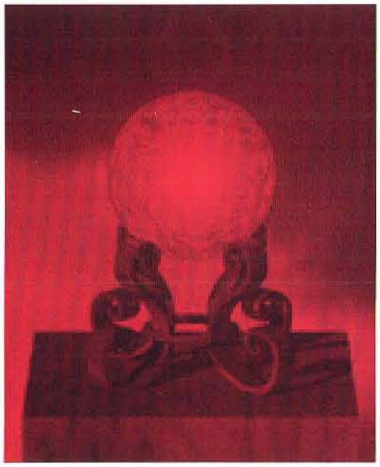

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CONCLUSION

This is just a small taste of the BeBox. We have presented an overview of the Be operating system along with some sample code to give you the general feel of Be application development. To learn more about the Be operating system, please visit our web site, where we provide on-line versions of our developer documentation as well as information about our product and company. We encourage developers interested in joining our support program to mail in the developer form, which you can find on the web site.

Be has many plans for the future. We are continuing to improve and add features to the Be operating system and development tools. We are also working on future versions of the BeBox, which will include more and faster processors – including a machine with four PowerPC 604 chips for the horsepower hungry.

We hope this article has succeeded in whetting your appetite for Be programming. We look forward to seeing all the incredible applications we know developers will write for the BeBox.

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SYMANTEC TOP 10

By Michael Hopkins, Symantec

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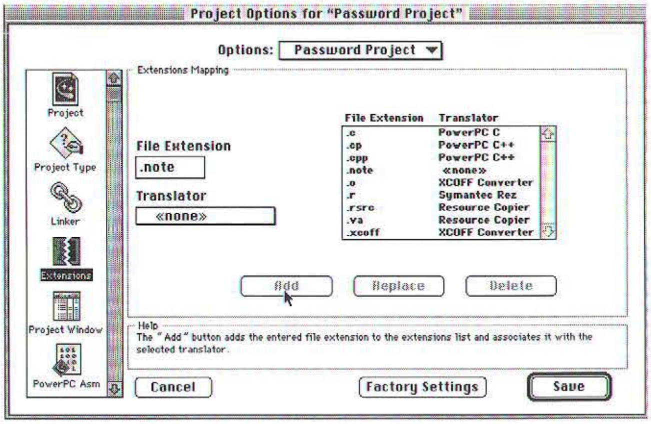
This monthly column, written by Symantec's Technical Support Engineers, aims to provide you with technical information based on the use of Symantec products.

Q: I want to be able to add files to my project, such as ReadMe files and notes, without having the project manager attempt to compile them. Is there any way to create an extension such as a `.note` extension in the SPM that does not use a translator?

A: Yes, there is. Quit the SPM and open your Symantec C++ folder. Copy the file «`none`» from your `Translators` folder (the one with the THINK Project Manager icon) to your (`Translators`) folder (the one with the Symantec Project Manager icon). With ResEdit, open the copy and choose **Get Info for «none»** from the **File** menu. Change the creator from `KAHL` to `None`. Save the file, and quit ResEdit. Now go back and launch your project in the Symantec Project Manager and choose **Options...** from the **Project** menu and go to the **Extensions** page. Type the name of the extension that you want to use for your non-compiled source files in the **File Extension** edit text box. Choose **«none»** from the **Translator** popup menu, click the **Add** button and then click the **Save** button.



Project Options for "Password Project"

Options: Password Project

Extensions Mapping

File Extension: .note

Translator: «none»

File Extension	Translator
.c	PowerPC C
.cp	PowerPC C++
.cpp	PowerPC C++
.note	«none»
.o	XCOFF Converter
.r	Symantec Rez
.rsrc	Resource Copier
.va	Resource Copier
.xcoff	XCOFF Converter

Help
The "Add" button adds the entered file extension to the extensions list and associates it with the selected translator.

Adding .note to the File Extensions List

Q: When I run my program with the Symantec Debugger from the Symantec Project Manager, the source code window does not come up and the debugger palette buttons **Go**, **Step**, **In**, etc. are not active. What is causing this, and how can I fix it?

A: This behavior is a result of your application being compiled with incorrect `'SIZE'` flags. The debugger requires that your project has **Background Null Events** and **MultiFinder Aware** checked on the Flags popup menu in the Project Type page of the Project Options dialog. Without these flags, Power Mac DebugServices will not be able to communicate with your application.

Q: I have written a brief program in the THINK Project Manager that is crashing my machine big time. The code is as follows:

```
typedef struct {
 int a, b;
} Foo, *FooPtr;

main()
{
 FooPtr foobuf;
 int i, size = 100;

 foobuf = (FooPtr) malloc( size*sizeof(Foo) );
 if (foobuf == NULL)
   exit(0);
 for ( i = 0; i < size; i++ )
 {
   foobuf[i].a = 0;
   foobuf.b = 0;
 }
}
```

Why is this causing me so much trouble? Is something wrong with `malloc`?

A: No, `malloc` is not at fault. By not including `<stdio.h>` and `<stdlib.h>`, your compiler does not have a function prototype for `malloc`, so it is guessing (incorrectly) about the size of the argument to `malloc`. Instead of using the type `size_t`, it is assuming an `int`. To avoid this problem, always choose **Require Prototypes** on the **Language Settings** page of your **THINK C Options** dialog. With that option selected, this would have resulted in a compilation error instead of a runtime error.

Q: Can I use Quickdraw GX with TCL and VA?

A: Yes, it is possible. For starters, initialize Quickdraw GX in `CApp::ICApp()` in the following manner:

```
void  CApp::ICApp()
{
 Ix_CApp(4, 24000L, 20480L, 2048L);

 // Initialize your own application data here.

 long graphicsHeapSize = 375;  // about 25K

 theGXClient = GXNewGraphicsClient( nil, gGraphicsHeapSize *
 1024L, 0L );
 FailNIL( theGXClient );
 GXEnterGraphics();

 assert (GXGetGraphicsError( nil ) !=  out_of_memory);
 // etc.
}
```

You will need to declare `theGXClient` as a member function of `CApp` of type `gxGraphicsClient` and include the proper header files in `CApp.cp`. Additionally, it is a good idea to override `CApplication::InspectSystem()` to check for the presence of QuickDraw GX. It is considered programmer error to call GX routines without verifying via `Gestalt()` that GX is present. Finally, override `CApplication::Exit()` in `CApp` using the following example:

```
void CApp::Exit( )
{
   GXExitGraphics();
   GXDisposeGraphicsClient( myGXClient );
   // etc...
   x_CApp::Exit();
}
```

Q: Why does `printf` crash when I use it in a TCL project? Is there any way to use TCL in conjunction with the console?

A: Yes, there is. The console package does some special initialization that needs to be done in place of the standard toolbox initialization that TCL does. To use the console with TCL, you should override `CApplication::InitToolbox()`, like this:

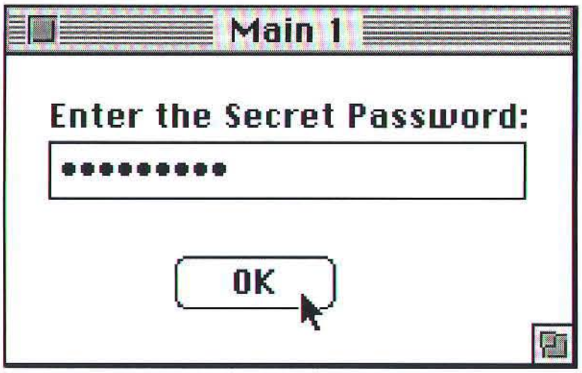
```
void CApp::InitToolbox( void )
{
   cout<< "Initialize console package"<<endl;
}
```

The call to `cout` in place of the standard `CApplication::InitToolbox()` will initialize the toolbox and the console package. This will enable the use of `printf` and `iostreams` routines with the console window. **Note**: You will need to add the `IOStreams` library and replace `ANSI_small` with `ANSI`.

Q: How do I make an application (or the Project Manager) multi-session, so I can throw it on a server and have several users run the application off of the server at the same time?

A: Use ResEdit to open the application you want to share. From the **File** menu, choose **Get File Info** for the application, and click the **Sharable** flag. **Save** the application, and **Quit** ResEdit. Your application can now be used by multiple users simultaneously.

Q: I am working on an application that prompts the user for a password. I need to be able to filter the edit text so that it displays bullet characters instead of the actual password. Is there an easy way to do this in VA?



Enter the Secret Password:

●●●●●●●●●●

Example of an Application that uses a Password Edit Text Filter

A: Yes. You must first create a derived class from `CDialogText` in VA. Then override the `DoKeyDown()` method in the following manner:

```
void  cPasswordText::DoKeyDown( char theChar, Byte keyCode,
              EventRecord *macEvent )
{
 Boolean pass = TRUE;
 short  ID;
 Str255 textString;

 switch (theChar)
 {
   case TCL_CR:
   case '\t':
   case kEnterKey:
     pass = FALSE;
     break;
   case kEscapeOrClear:
     if (keyCode == KeyEscape) pass = FALSE;
     break;
   default:
     GetTextString( textString );
     if ( !  isalnum( theChar ))  // pass spaces and delete keys
     {
       inherited::DoKeyDown( theChar, keyCode, macEvent );
```

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```
       pass = false;
     }
 }
 if (pass)
 {
   textString[0]++;
   textString[textString[0]] = '•';
   SetTextString( textString );

// add code to store actual characters typed here

   if (itsTypingTask && itsTypingTask->CanStillType())
   {
     ID = this->ID;
     BroadcastChange(dialogTextChanged, &ID);
   }
 }
 else
   itsSupervisor->DoKeyDown(theChar, keyCode, macEvent);
}
```

Q: Can I use STL with Symantec C++?

A: Yes, Symantec C++ supports a modified version of STL. For best results, you need to use 8.0.3 of our Symantec C++ compiler. Patches are available via anonymous ftp at ftp://devtools.symantec.com/updaters/sym.cpp-va-tcl.update.

Q: I'm using your new Pascal Universal Headers for THINK Pascal and I get pages of link errors. Why is this?

A: When you use our Universal Headers, you need to make sure that you have the proper `uses` statements for the toolbox routines that you are using. You can no longer rely on the correct `uses` being used automatically. You will need to be very conscious of which interface file you use. See the Readme for further details.

Q: I call the `Place()` method of a `CPanorama` object I have created in the `Main` view using VA, but nothing happens. `Place()` works fine for other objects derrived from `CPane`. What gives?

A: `Place()`, inherited from `CPane`, sets the data members `hEncl` and `vEncl`, which indicate the pane's position relative to `itsEnclosure`. In the case of `CIconButton`, for instance, `itsEnclosure` will be the `itsMainPane` member of the Document (`itsMainPane` is the `CPanorama` object that acts as the background of every view of type `Main Window`). Hence, calling the `Place()` member of a `CIconButton` visibly moves the button relative to the window. In the case of a `CPanorama` object however, `itsEnclosure` is actually `itsScrollPane`. A panorama's `Place()` function will not visibly change its postion. You should instead call `itsScrollPane->Place()` to move a panorama relative to the window.

If you have a question or topic for a future Top Ten article, please send us your ideas. If you have found an answer to an obscure problem that has been eluding you, or you have a stumper, send it to topten@devtools.symantec.com. If we choose to use your question in our column, your submission will be immortalized in print, and we will mail you a cool Symantec T-shirt.

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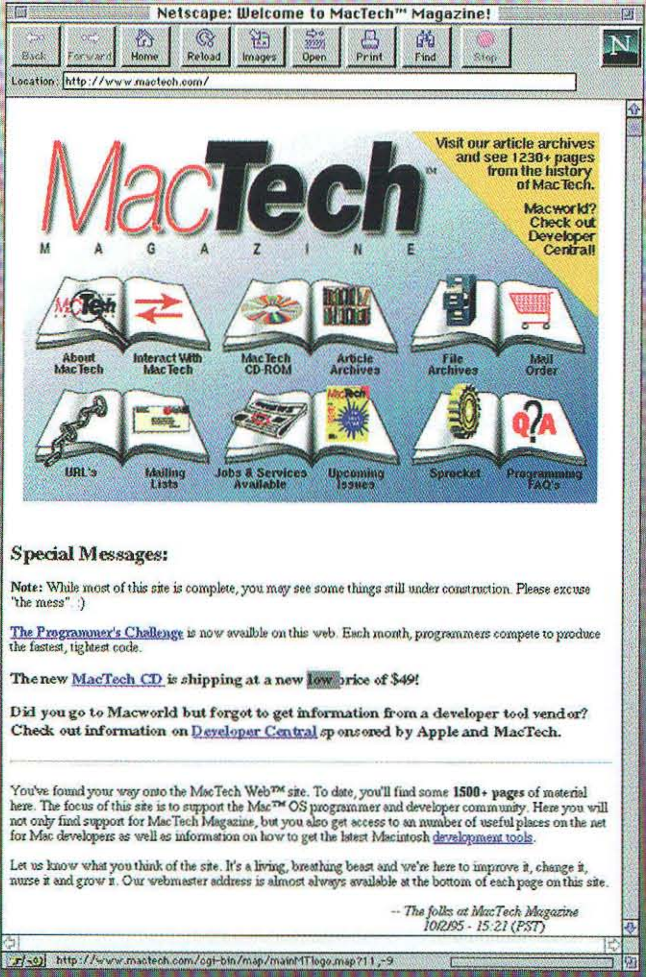

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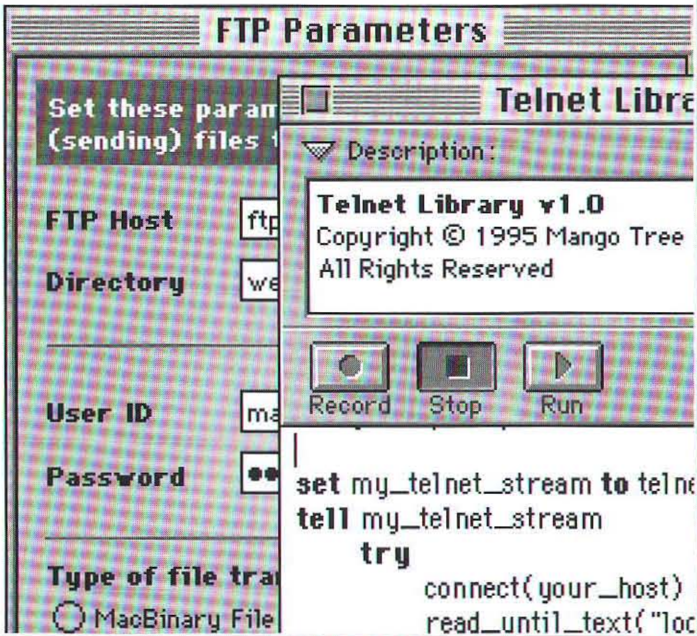

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tell my_telnet_stream
    try
        connect(your_host)
        read_until_text("loc
```

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By Hillel N. Cooperman and Aparajita Fishman, Cambridge, MA

Java Rules

A Java FAQ

This is the first in what will be several articles on Java and the Macintosh implementations. Watch this column in the future for a beginner lesson on Java programming and reviews of offerings from Natural Intelligence, Borland, Sun, and others for Macintosh programmers. – Contrib. Ed, jaw

Considering the amount of hype surrounding Java, it is nearly impossible, without a lengthy and thorough investigation, to really understand what Java is all about, and to know what it can and cannot do for you. As an antidote to all the hype, we are going to try to give some honest answers about Java in this article. We hope it will be helpful as you decide about how to pursue this new technology.

According to Sun's "The Java Language – A White Paper", Java is a "portable, interpreted, high-performance, simple, object-oriented" programming language. Buzzword-shy it is not. In the questions below we will look at Sun's claims and explain what they mean.

1. WHAT IS JAVA?

Java is a programming language. It is really that simple. Much of the confusion on this topic is from people mixing up what Java will enable with what Java actually is. However, for the purposes of this article, Java's importance is based on what it is currently capable of doing. That's what we'll focus on.

First a little bit of history. In April of 1991 the Java development team (or "Green" team, as they then called themselves) started work in a building located off of the Sun campus. Java was originally conceived as a programming language and operating system for consumer electronics devices (i.e. set-top boxes). The team envisioned the technology being licensed in the same way that Dolby Systems licenses its noise reduction technology. While market forces shifted so that the set-top box market slipped away as a potential home for the Java technology, the Web appeared on the horizon as a likely candidate for Java-based interactivity. With this goal in mind, Sun introduced Java in May of 1995. Sun's current marketing reflects the idea that Java is *the* "Internet application language." We will try to delve a little deeper.

Yes, Java is a language but it is also a concept and an approach to deploying applications.

2. WHAT IS A JAVA APPLET?

As we said before, many people confuse Java's capabilities with what Java actually is. The primary task with which people associate Java is creating interactive content for the Web. By this we mean a level of interactivity beyond the basic forms and buttons provided by a combination of standard HTML and CGI programming. An applet is a program that is called in the process of displaying HTML. Calling an applet from HTML looks like this:

Hillel Cooperman & Aparajita Fishman – Hillel Cooperman (coop@natural.com) and Aparajita Fishman (aparajita@natural.com) are, respectively, Chief Evangelist and a Senior Software Architect, at Natural Intelligence, Inc.

Sample HTML

```
<HTML>
<HEAD>
<TITLE>Applet Page</TITLE>
</HEAD>
<BODY>
<H4>This is an example of a Java applet:</H4>
<HR>
<APPLET CODE=myApplet.class width=100 height=50>
</APPLET>
<HR>
</BODY>
</HTML>
```

Sample Applet

```
import browser.applet;
import awt.graphics;
class myapplet extends Applet  {
        public void paint(Graphics g) {
                g.drawstring("Hello world.", 25, 25);
        }
}
```

When a Java-enabled web browser (such as HotJava or Netscape) encounters the `APPLET` tag, it loads the Java class (applet) referenced in the quotation marks. Once loaded, the browser runs the code contained in the applet and performs whatever function is specified by the code.

Having applets run in your web browser wouldn't be such a great feat if they weren't small enough to be loadable in a relatively short period of time; interactivity on the web is not very interactive if it takes an hour to load an applet. Just as Macintosh applications are built upon the Macintosh Toolbox, which provides a significant foundation of core functionality, Java applets are built upon Sun's AWT (Abstract Window Toolkit), a class library which provides applets with their core functionality. And just as the Macintosh Toolbox resides on each user's machine, so too is AWT a part of each user's browser, obviating the need to load AWT over the net. The end result is that Java applets tend to be very compact, which translates into faster load times.

3. IS JAVA ONLY GOOD FOR CREATING APPLETS?

Currently there are two options when using Java. The first is to create AWT-based applets which can only run within a Java-enabled browser or application. The second is any programs which use only console input and output. Although used mainly for applets now, Java is a robust, general purpose language with many possible applications.

4. HOW EASY IS IT TO GO FROM C/C++ TO JAVA?

It is very easy.

One of the Java team's stated objectives was to keep the language familiar to the majority of programmers. Java's expression syntax is the same as C's and it incorporates the key object-oriented features of C++. This was done to give programmers a common reference point when porting their skills to Java. And, from our perspective, Java provides most of the power of C++ with none of the pain. This was achieved by avoiding those "features" of C++ which, while providing tremendous power for those "in the know," are a source of tremendous complexity and befuddlement for most programmers. In particular there are two potential pitfalls in C++ that Java avoids: raw pointers and multiple inheritance. In place of pointers, Java provides true type-safe arrays and strings, as well as runtime type-checked dynamic casting.

5. ARE JAVA APPLETS CROSS-PLATFORM?

The Java specification actually consists of two parts, the language specification and the Java runtime environment. The language specification, like any other programming language, is independent of the platform on which it is deployed. Java's runtime environment is a byte code virtual machine (VM) interpreter that allows an applet to run on any given platform. Think of it as a simulated CPU with a platform neutral machine language.

The Java compiler compiles Java source code into Java byte code, and this byte code is executed by the virtual machine. Because the Java environment and virtual machine are platform-independent specifications and have been ported to multiple platforms, compiled Java applets are themselves platform-independent.

There are two browsers that are currently available (or are about to be available) that run Java applets. HotJava is Sun's Java-capable browser (written in Java) that runs on Solaris and Windows NT. As of this writing, beta versions of a Java-capable Netscape browser are available on Solaris, Windows NT, Windows 95, and of course Macintosh.

6. WILL JAVA ALLOW VIRUSES AND DESTRUCTIVE PROGRAMS TO BE TRANSMITTED VIA THE NET?

As we mentioned before, Java applets are built on AWT. AWT provides two levels of security. On the first level, AWT

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prevents applets from having free access to your computer's file system. So, for example, it would be extremely difficult for someone to write a Java applet which did any damage to your computer's files. The second level of security involves a byte code verifier in the Java virtual machine. The verifier checks to see if any of AWT's security classes have been overridden or if anything in the applet will make the browser crash. If both conditions are met, it allows the non-offending applets to run in your browser. Otherwise, it rejects them. While a good concept, the verifier can be fooled; be careful.

7. HOW FAST IS JAVA?

The real question is, "How fast is Java in relation to other programming languages?" The answer is, Java falls somewhere in between the speed of static languages such as C/C++ and dynamic languages such as SmallTalk. Preliminary benchmarks show that Java byte codes typically execute at about 50% of the speed of well written C code for processor intensive tasks. The bottom line is that Java is significantly faster than dynamic languages such as SmallTalk and interpreted languages such as Visual Basic. The secret to Java's speed is the design of the virtual machine instruction set. The instruction set is close enough to most native CPU instruction sets that there is very little overhead in translating from Java byte codes to native instructions. Future versions of the Java byte code interpreter will be able to translate from Java byte codes to native machine code on the fly (also known as "just-in-time compilation"), which will result in even greater execution speed.

8. WHY DOES JAVA HAVE "AUTOMATIC GARBAGE COLLECTION" AND "MULTI-THREADING"?

OK, so that's really two questions. One of the priorities in creating the Java language was to keep the language simple. Or more specifically, the goal was to avoid a lot of the complexities of C++. One of the common complaints about coding is the work you must do to manage your memory, not to mention the consequences if you don't do it properly. Studies have shown that up to 50% of a programmer's time, when using non-garbage-collected languages such as C and C++, goes into managing memory storage. And, a significant amount of debugging time goes toward tracking down memory-related bugs.

The beauty of the Java Virtual Machine is that it takes care of memory management for you. This process is called "automatic garbage collection." A low-priority thread periodically scans your applet's memory for unused objects and recycles the memory they were using. It does this by keeping track of what parts of your program are using memory, and determining when those chunks of memory are no longer needed. Many programmers mistakenly think that garbage collection is inherently slower than manual memory management. This impression stems from the fact that up until now, most mainstream languages that used garbage collection were interpreted and thus inherently slow themselves. In fact, a well-implemented garbage collector is on average as fast if not faster than the best implementation of manual memory management. A well-implemented garbage collector can be faster than manual memory management because it can reclaim unused memory in one fell swoop instead of in hundreds of small increments.

As for multi-threading, we just saw one very good use of multiple threads. Aside from garbage collection, today's fast microprocessors can easily support multiple threads of execution, allowing more flexible and robust solutions to many classical programming problems. For example, any asynchronous task, which requires polling of a state flag, can be spun off into a separate thread allowing the main thread of execution to continue unabated without worrying about the result of the task.

9. WHAT IS THE FUTURE FOR JAVA ON THE MACINTOSH?

As we mentioned above, Netscape is planning to release a Macintosh version of its browser that is Java-capable. Programming in Java on the Macintosh is a different story altogether. There are currently two options. As of this writing, Sun is planning on releasing a Macintosh version of their Java Development Kit in early 1996. By the time you read this article, Developer Release 1 of Roaster™, the other option on the Macintosh, will be shipping. No discussion of Java in a Macintosh programming magazine would be complete without mention of Roaster. However, Roaster is a product from our company, Natural Intelligence, so I'll keep the marketing to a minimum and give you the basics.

Roaster is an integrated development environment for writing Java applets. Roaster consists of several components:

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FOR WEB DATABASES
http://www.everyware.com/ad2/

Project Window	This is used for the organization of your source code and compiled byte codes in a Finder-like view.
Source Code Editor	The editor includes a toolbar with a full suite of code-editing functions, context-sensitive color and style syntax formatting, and drag and drop support.
Runtime Engine	This allows you to put up a native window in which you can test your applets.
Compiler	The compiler generates Java byte codes.

We're including this description in the article to give you an idea of what will be in Natural Intelligence's Macintosh applet development environment for Java. But hopefully, Sun's environment will be out soon, so that you will have more than one option for developing in Java on the Macintosh. *[Metrowerks has announced support for Java development as well. See Newsbits. – Ed. Asst. jtk]*

10. WHERE CAN I GET MORE INFORMATION?

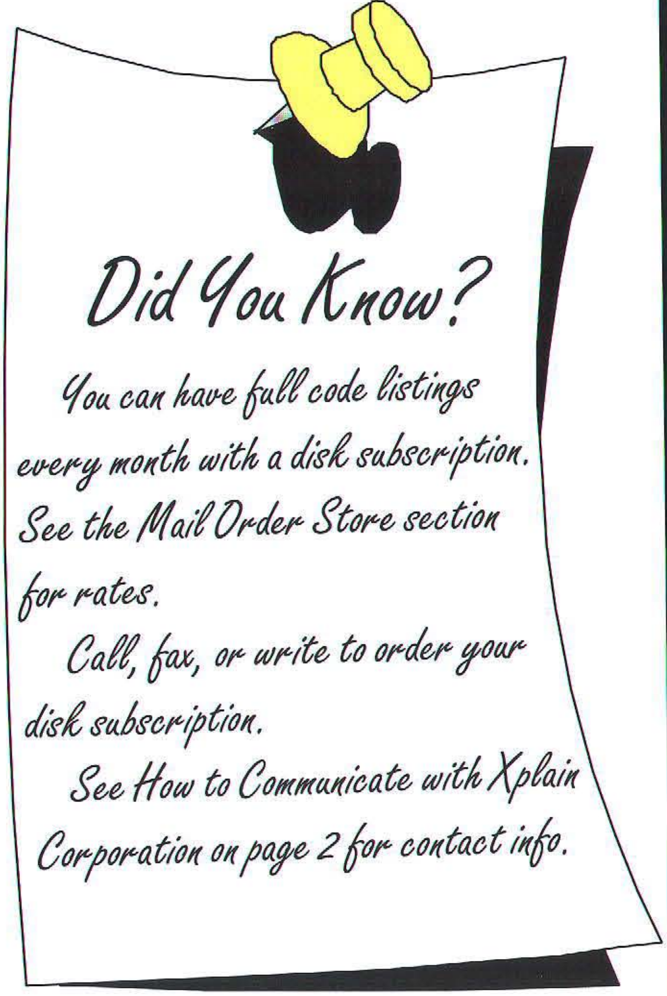
I always balk at putting references to the net in articles that won't be published until weeks after they're written. The net is so dynamic that they may end up being out of date. So cross your fingers and check out these resources. Most should still be relevant by the time you read this, though I'm sure that there will be many more by the time this is published.

Java Home Page	http://java.sun.com/
John December presents Java	http://www.rpi.edu/~decemj/works/java.html/
Java Jive	http://catalog.com/dddu/javajive.html/
Natural Intelligence, Inc.	http://www.natural.com/
Gamelan Java Resource Registry	http://www.gamelan.com/
Java Usenet Newsgroup	news:comp.lang.java
Java-Mac mailing list	send "subscribe java-mac" to majordomo@natural.com

These are just a few of the resources out there. Keep your eyes peeled for the inevitable avalanche of books and magazine articles on the subject.

SUMMARY

In closing, despite your natural reaction (as a marketing savvy programmer) to dismiss the hype surrounding Java, there really is something to get excited about. While Java has its limitations, it is a definite leap ahead of today's industry standard programming languages and approaches. With your support of the language, there is no doubt that Java will continue to thrive in the future.



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Tango
FOR WEB DATABASES
http://www.everyware.com/ad3/

FROM THE FACTORY FLOOR

By Dave Mark

Java Talk

You, the MacTech readership, have been long asking for a Metrowerks presence in the magazine. This is the first in a brand new series of articles by longtime MacTech columnist Dave Mark. Dave recently joined forces with Metrowerks to produce a series of CD-ROM based programming products. This month, Dave interviews Greg Galanos, president and CEO of Metrowerks, about Metrowerks' recent announcement on their new Java development environment.

Dave: Metrowerks just announced the first Mac-based Java development environment. What can you tell me about it?

Greg: We've been tracking Java for over a year now, noting the developments in the field and the positioning of the language with respect to Internet development. A little over four months ago, we initiated contact with Sun and developed a complementary position in order to properly support Java programming and Internet development within CodeWarror.

The Sun deal was signed a couple of days before Comdex. It is both a licensing and a development deal where Metrowerks will license compiler technology, runtime interpreters, Java classes that support cross platform development, as well as the HotJava browser. These technologies will be seamlessly merged with the CodeWarrior Development Environment in order to bring them to our user base as a first developer release in May. This means we'll support source-level debugging, browsing and compiling as if you were working with C/C++ or Object Pascal within the IDE.

Dave: If you want to produce Java applets, you'll have to learn the Java programming language, something akin to learning C++. Do you think Metrowerks will ever offer a way for non-programmers to produce Java applets?

Greg: Ahh, the holy grail.... Metrowerks is committed to building better, easier-to-use tools. I suppose the cryptic response would be to say that we will support Java in much the same way that Borland will support Java.... The answer here is that we will strive to do so but it's not a short-term proposition. This will take time, but yes, we are moving quickly towards that goal and will be taking Constructor down that road.

Dave: What is Sun's role in all this?

Greg: Sun has been working on different manifestations of Java for about 5 years. It came out of some pretty serious R&D efforts into embedded appliance systems. It was found at that time that C++ was not ideal for embedded, secure development because of what Sun calls unsafe language features: pointers, operator overloading, multiple inheritance and the absence of garbage collection. (Note: multiple inheritence is available in the Java interface, but not in the classes themselves). Java is a language that is very close to C++ without the features that are considered insecure or dangerous, especially for a languge designed for building programs that are downloaded to your desktop machine and which will then run there.

Sun is doing some very interesting things in order to nurture Java and cross-platform Java implementation. For instance, they are licensing their technology and working with strategically chosen desktop partners in tools (Metrowerks, Borland), communications (Netscape, Spyglass), content development (Macromedia, others). But they are also

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controlling the technology and the language standard until the language is embedded, so to speak, in Internet development in order to stave off the featuritis that comes from standards committees (I point to C++ as a specific example of this). This is a good thing — actually the reverse of what usually happens with a new language.

Finally, Sun is controlling and furthering the security technology that will guarantee that a Java applet is, in effect, secure. Part of the technology licensed from Sun addresses the areas of security and validation, what is applied to the Java byte code stream once it passes the threshhold of your particular desktop machine.

Metrowerks and Sun have teamed up to ensure that Macintosh plays an important role in Java development. This relationship is both one of making the tools available to our customers in a timely manner (WWDC) and also working with Sun on market-creation strategies. MW has licensed all the Sun technology and will be rolling new technology into its Java products as time progresses. Of course, Metrowerks will also be developing new technology for Java, optimization techniques for runtime improvements, AWT (abstract windowing toolkit) support, interface building tools, etc. This is a long term play for us and we intend to support our customers in their quest to program the net and increase their own revenues.

Dave: Will developers have to pay any royalties on applets they build using JavaWerks? Are there any licensing issues developers need to be aware of?

Greg: Wow, "JavaWerks"! Quick, let's get a trademark! Seriously though, applet developers shouldn't have to worry too much about licensing issues unless they are also shipping the byte code interpreters. Sun is striving to make this technology an open platform; therefore there are no direct royalties or other costs associated with developing and shipping applets. Java implementers such as Metrowerks and the other Java official licensees bear the burden of the royalties in a distributed manner, so it makes a lot of sense from a developer's standpoint. The implementers are held to a very high standard and must pass all sorts of validation suites before shipping their toolsuite. This is because Sun absolutely wants Java to be cross-platform, and for this to be achieved much more validation must be applied to the tools to ensure that the compilers generate the proper byte code for any particular release.

Dave: What impact do you think Java applets will have on more mainstream application development? For example, do you think we'll ever see a Java word processor or spreadsheet applet? If so, how will folks pay for it?

Greg: I think there are really two markets here. The first is the development of applets or small applications that live on a Web server and execute a specialized function that an end-user wants to acquire. I'll take the easy example: Imagine a specialized applet that implements peer-to-peer communication with a stock quote server (local Java applet talks to remote Java applet) and warns you when you should buy or sell. An end user is likely to see value in this applet and be prepared to pay a price of (let's say) $9.95 a month for this service. Result: applet developer sells to end-user without traditional distribution channel. There are many, many examples of this from gardening, to cooking, to special travel deals, that a consumer will be interested in procuring in the home directly from the service provider.

The second market is for today's applications vendors (our customers) to hotwire their application to the Internet either by implementing applets in their application suite that can be sent off across the net to "do something" or by embedding applet technology in their application to host applets that are downloaded from the net. This could be as simple as running the applet in a web browser, or as complicated as allowing the applet to actually "plug in" to the application itself. Again, the consumer could then choose from any specialized applet that is destined to work with ClarisWorks or FreeHand or Illustrator, to give a few examples. Look at the Java runtime model as a very lightweight, multi-threaded container architecture without SOM and the fragile base class problem that happens to be the Achilles' heel of C++. This is a powerful concept.

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Dave: Java is normally compiled into byte-code, then interpreted. Will there ever be a fully compiled Java with no interpreter in the loop?

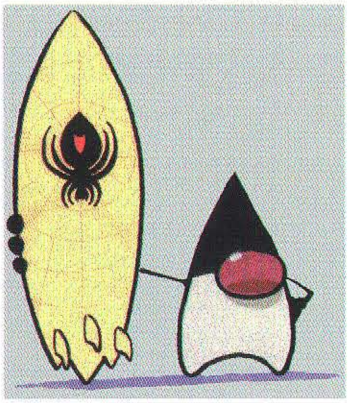
Greg: Essentially, the byte code runs on the Java virtual machine (the interpreter) which translates the byte-code into native instructions. I think you'll see both just-in-time compilers and hybrid dynamic/intepreted compilers that will be necessary to speed up local execution. So the answer is Yes. The real question is: "When?"

Dave: Where can people go to get more information?

Greg: Well, the fastest way to get to all the hot Java sites is to go to http://www.metrowerks.com. We have a full hookup to licenses sites, user sites, Sun's numerous sites. The other place you can go is to http://java.sun.com (but we point there too!). There's also the newly created newsgroup news:comp.lang.java which has nearly as much traffic as comp.sys.mac.programmer.codewarrior. The Java newsgroup is nearly absent of Mac programmers, who have not had the tools to date. We definitely are going to change this. You can also send email to java@metrowerks.com to receive info on beta testing.

Dave: Who the heck is Duke, and why is he stealing Ahnold's limelight?

Greg: Hey, Duke's cool. He's the Java mascot, a molar-shaped imp with a red nose carrying a surfboard. I can just see Arnold surfing the web jolted out of his brain on this Java stuff. Arnold and Duke are buddies. Arnold is Duke's protector. Like Terminator II, yeah.



By Brad Schrick and Eric Bickford

Becoming a Macintosh Service Provider

Tales from the field

For several months *MacTech* has published articles explaining how to configure and program Internet WWW servers. Of course, Macintosh Web development isn't just programming: there's money to be made! Eric Bickford and Brad Schrick, two professional Macintosh WWW developers, report on market conditions. The forecast is sunny.

ERIC BICKFORD

It began innocently enough. Put up a few web pages and see what happens. Seven months later the Mac Web Consultants Directory http://www.macweb.com/ had received listings from 440 consultants in 20 countries throughout the world (80% of those in the USA).

The Mac Web Consultants Directory was launched in April 1995 at WebEdge I, the Macintosh WWW Developers Conference. The idea behind the Directory was simple: Provide a searchable database of consultants who are experts in electronic publishing on the World Wide Web using Apple Macintosh and compatible computers.

Listing

To register, a consultant need only complete a free online application form. The application form asks for contact information and a short description of the services the consultant offers. This description becomes the consultant's primary vehicle for attracting clients who search the Directory.

The application form also has a skills matrix for Services, Scripting Languages, Database Programs, and Web Tools. Any individual consultant might be skilled in CGI programming using AppleScript, C++, or Frontier. They might be skilled with a Macintosh database like 4th Dimension, Butler, or FileMaker Pro. Or, they are skilled in a specific web-related tool like AppleSearch or NetCloak.

Once a consultant creates a profile, they have the capability to update their profile at any time. Should a consultant be unavailable, for example, they're encouraged to update their availability status to "Booked Solid".

Searching

The Directory's web-based search screen is very simple: Select the field you wish to search, such as "City", and enter a search term. Results of a search are returned as a hitlist of records with consultant contact and profile information. Small icons on each consultant profile give an indication of the special skills that a consultant might offer.

The individual consultant must sell himself. Each listing in the Directory should have a URL pointing to the consultant's home page. The quality of a consultant's home page is often the primary selling point for acquiring new projects.

It Actually Works

Large and small companies and organizations use the Directory to find experts to help them build mission-critical, industrial-strength

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Brad Schrick and Eric Bickford – Brad Schrick is a consultant in Palo Alto, CA. Eric Bickford is the author of Web-FM and a product development engineer for the Web Broadcasting Co. in Palo Alto, CA.

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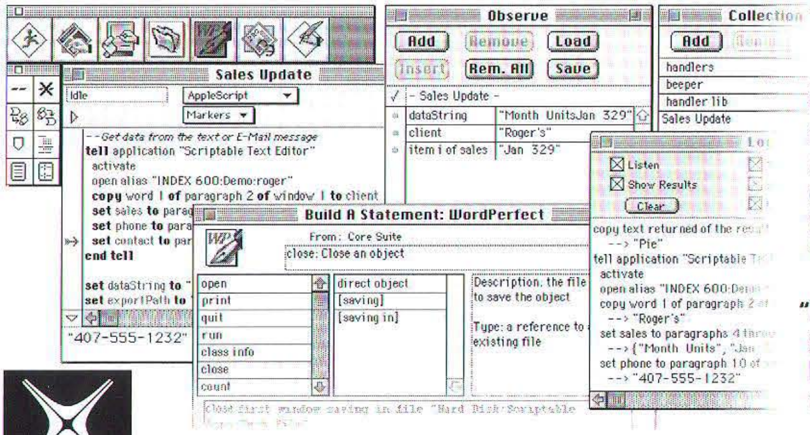

```
--Get data from the text or E-Mail message
tell application "Scriptable Text Editor"
  activate
  open alias "INDEX 600:Demo:roger"
  copy word 1 of paragraph 2 of window 1 to client
  set sales to parag
  set phone to para
  set contact to par
end tell

set dataString to "
set exportPath to "
```

"407-555-1232"

dataString	"Month UnitsJan 329"
client	"Roger's"
item i of sales	"Jan 329"

Description: the file to save the object

Type: a reference to existing file

```
copy text returned of the res
  --> "Pie"
tell application "Scriptable T
  activate
  open alias "INDEX 600:Dem
  copy word 1 of paragraph 2 of
    --> "Roger's"
  set sales to paragraphs 4 thro
    --> {"Month Units", "Jan
  set phone to paragraph 10 of
    --> "407-555-1232"
```

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solutions on the WWW. It's rewarding when you plan and build something like this Directory and it actually works. Again and again I find I'm talking to or reading email from someone in the directory who mentions getting a project or referral from it.

The Directory, however, isn't without some problems. Because listing as a consultant is free, some people have listed themselves who arguably should not be in the Directory. For example, a quick search of the Directory finds that not all consultants have a home page URL. Likewise, an even 10% of all consultants listed have an email address with an .edu university top-level domain.

BRAD SCHRICK

In mid-1993 Chuck Shotton wrote MacHTTP, and showed that a Macintosh could be a competent server on the World Wide Web. By late 1994 there was a lively group of commercial, educational, and personal Mac OS WWW servers using MacHTTP on the Web.

Show me

However, despite these many examples and an active discussion list, even Macintosh advocates often believed that UNIX was required to serve pages on the WWW. Instead of arguing endlessly, Brad Schrick, a MacHTTP advocate and customer, decided to try to list the servers that use Mac OS to deliver World Wide Web services.

The list debuted in October 1994

The first listings were easy to choose, starting with Chuck's site on his IIci at the University of Houston (now www.biap.com), Apple's front door, tended by Dale Mead at www.apple.com on a Mac IIfx, Stephen Collins's Web66 'WWW cookbook' at web66.coled.umn.edu (with several other Mac WWW sites), Jon Wiederspan's CGI tutorial (http://www.uwtc.washington.edu/computing/www/lessons/) at the University of Washington, and about 50 others.

Over the past year, the lists were automated to allow Mac webmasters to enter and change their own listings, and the lists were grouped by new listings, geography, equipment, and software in a continuing process to help Mac webmasters evaluate techniques and markets for their work.

The Mac WWW Server lists at http://brad.net/macwww/ currently hold about 1100 listings for about 900 to 1000 distinct Mac servers from around the world, and are growing at a pace

Continued on page 94

By Alan B. Oppenheimer

Inside HomeDoor

Make one web server act like a network of servers

The HomeDoor™ Default Home Page Server is a newly-announced product from Open Door Networks. HomeDoor enables a single Macintosh Web server to serve default home pages for multiple domains. This article describes the inner workings of HomeDoor.

PRODUCT SUMMARY

HomeDoor is a Macintosh extension and associated Admin application which enables an Ethernet-based Macintosh to redirect requests for particular default home pages to particular subdirectories on any Web server. For example, HomeDoor can redirect URLs of the form http://www.companyX.com/ to the form http://www.yourwebserver.com/companyX/. HomeDoor supports up to 256 such redirections, allowing you to set up a large number of default home pages on a single MacOS-based Web server. HomeDoor also supports the creation of complete "virtual" domains associated with each of these home pages.

The Web server (or servers) to which HomeDoor redirects requests do not necessarily have to be in the same machine, or even on the same network, as HomeDoor. You configure HomeDoor with a unique IP address for each default home page it is going to serve. You will also generally want to assign a domain name, such as www.companyX.com, to each of these addresses. For each address, you then configure HomeDoor with the URL to redirect that address to. When HomeDoor gets an HTTP request to one of the addresses it's managing, it redirects that request to the configured URL. HomeDoor can be used to serve default home pages in this manner, and also to serve full "virtual" domains, redirecting not only URLs of the form http://www.companyX.com/, but also URLs of the form http://www.companyX.com/file-or-directory. When redirecting such URLs, HomeDoor preserves the "file-or-directory" part, thus supporting the creation of complete virtual domains.

MULTIHOMING – THE KEY TO HOMEDOOR

The key architectural component of HomeDoor is *multihoming*. Multihoming is the ability of a single physical node on a network to have more than one address (or "home") on that network. Neither MacTCP nor the TCP/IP implementation in Open Transport provides multihoming, although Apple intends multihoming to be a feature of Open Transport 2.0. HomeDoor thus had to implement a simple form of multihoming itself. HomeDoor's multihoming is limited to those Internet protocols required for HTTP (specifically ARP, IP and TCP), plus a small subset of ICMP so that HomeDoor can respond to pings for its addresses. HomeDoor does not provide a general-purpose implementation of multihoming.

HomeDoor's multihoming is implemented directly on top of the Macintosh Ethernet driver, below the TCP/IP stack.

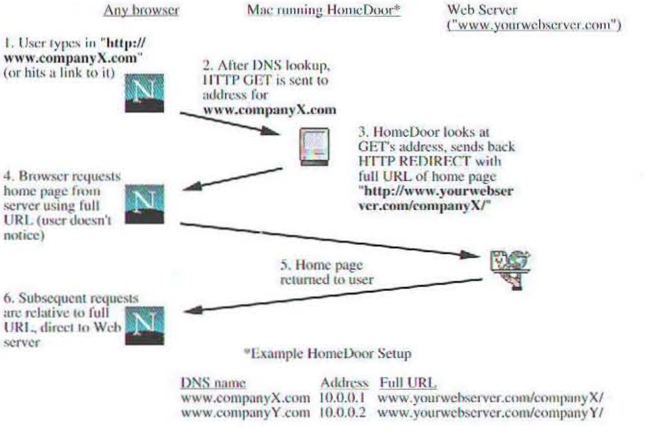
Alan B. Oppenheimer – Alan B. Oppenheimer was part of the original team that created the AppleTalk network system. Alan was responsible for the design of many of AppleTalk's lower layer protocols and led the team at Apple responsible for the Apple Internet Router and Apple Remote Access. Alan left Apple to found Open Door Networks, Inc. in January of 1995. Alan's email address is alan@opendoor.com.

HomeDoor tells the Ethernet driver to pass it all packets of Ethernet type "ARP" or "IP." Because of the way the IP protocol suite works, the packets HomeDoor needs to receive are either broadcast (ARP packets), or sent directly to the Macintosh's Ethernet address (IP packets). This fact is important, because it prevents HomeDoor from needing to have the Ethernet driver listen to every packet sent on the network, which would adversely affect performance.

After being passed an ARP or IP packet from the Ethernet driver, HomeDoor determines if the packet is intended for an address in its address range. If the packet is in range, HomeDoor processes the packet as appropriate, implementing the required parts of ARP, IP, TCP or ICMP. If the packet is not in HomeDoor's address range, and MacTCP is running, HomeDoor passes the packet to MacTCP. Otherwise HomeDoor discards the packet. By passing packets to MacTCP, HomeDoor can run on the same Macintosh as any MacTCP client or server, and specifically in the same Macintosh as a Web server for which it is serving default home pages. HomeDoor does not, however, require MacTCP to run. HomeDoor also will not currently run at all on a Macintosh which is running Open Transport, due to OT's radically different driver architecture.

Redirection

As shown below in figure 1, HomeDoor takes advantage of a feature in HTTP known as redirection. A browser wishing to look at a Web page issues an HTTP GET command to the address indicated by the first part of the URL, after obtaining that address from a domain name server (DNS). If the address is being managed by HomeDoor, HomeDoor receives the request and returns an HTTP REDIRECT in response. The REDIRECT contains the actual URL of the associated default home page. The browser receives the REDIRECT and then requests that page directly from the actual server, using the new URL. From then on, the browser talks directly to the Web server if other (relative) links on that server are accessed.


Any browser
Mac running HomeDoor*
Web Server ("www.yourwebserver.com")
1. User types in "**http://www.companyX.com**" (or hits a link to it)
2. After DNS lookup, HTTP GET is sent to address for **www.companyX.com**
3. HomeDoor looks at GET's address, sends back HTTP REDIRECT with full URL of home page "**http://www.yourwebserver.com/companyX/**"
4. Browser requests home page from server using full URL (user doesn't notice)
5. Home page returned to user
6. Subsequent requests are relative to full URL, direct to Web server

*Example HomeDoor Setup

DNS name	Address	Full URL
www.companyX.com	10.0.0.1	www.yourwebserver.com/companyX/
www.companyY.com	10.0.0.2	www.yourwebserver.com/companyY/

Figure 1. How HomeDoor works

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Virtual domains

To be precise, HomeDoor actually does more than simply returning, in the REDIRECT, the URL that has been configured for the address requested. Technically speaking, HomeDoor actually replaces the part of the URL which specifies the Web server itself with the URL to be returned. So a URL of the form http://www.companyX.com/ is returned as http://www.yourwebserver.com/companyX/, but a URL of the form http://www.companyX.com/file-or-directory becomes http://www.yourwebserver.com/companyX/file-or-directory. Since the "file-or-directory" part can in fact be arbitrarily long, a full "virtual" domain can be served by HomeDoor.

Completing the illusion

HomeDoor effectively allows a single Macintosh Web server to serve default home pages, and in fact full virtual domains, for up to 256 different domain names. HomeDoor does so in a manner that is almost totally transparent to Web browsers. The only significant exception is that most browsers display a page's actual URL in their "location" f ield. Thus, for example a browser user would see the URL http://www.yourwebserver.com/companyX/, even though they typed in or accessed the URL http://www.companyX/. Even this minor side-effect, however, can be eliminated by using a DNS to set up an appropriate alias to the actual Web server, and using HomeDoor to redirect to that alias as opposed to to the Web server itself. For instance, instead of redirecting http://www.companyX.com to http://www.yourwebserver.com/companyX/, you could redirect it to http://www2.companyX.com/companyX/, where www2.companyX.com is an alias for www.yourwebserver.com. In this way, not only will the Web browser user see the correct domain name in the "location" field, but it will appear to the user that the domain in question has not one but two complete Web servers associated with it (www.companyX.com and www2.companyX.com).

Subtleties of HomeDoor

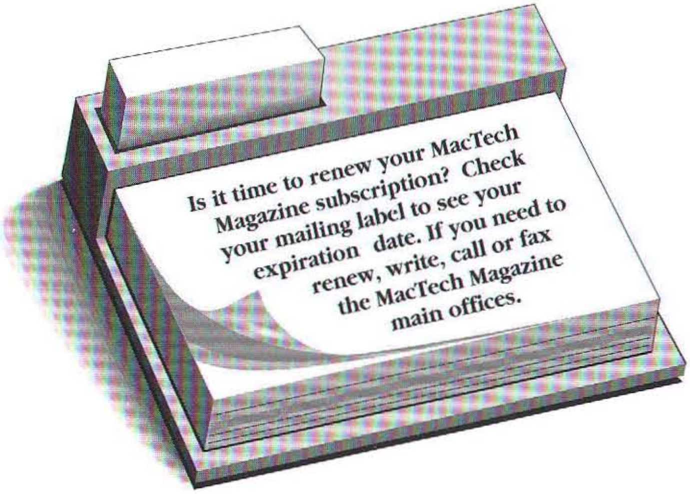
The HomeDoor design contains a number of subtleties which might not be immediately apparent. These subtleties are based on the fact that HomeDoor allows you to enter a full URL for each address it is managing. This flexibility allows, for instance, a single HomeDoor server to serve home pages and virtual domains for more than one Web server. And, although HomeDoor runs on a Macintosh, there is no reason that the Web servers themselves need to be Macintoshes. HomeDoor can serve default home pages for any type of Web server whatsoever. HomeDoor can also redirect URL's to other network services, allowing, for instance, an HTTP URL to be redirected to an FTP server. Finally, with some small modifications, the HomeDoor architecture can be enhanced to provide many additional services. One area for immediate investigation involves having HomeDoor redirect a particular URL to a URL chosen randomly or sequentially from a group of other URLs, enabling HomeDoor to serve as the front end to a Redundant Array of Inexpensive Computers (RAIC).

HOW TO FIND OUT MORE

Open Door Networks maintains a complete set of home pages on the HomeDoor product. Not only do these pages include product details, example pages served by HomeDoor and a full copy of the HomeDoor Users' Guide, but also a downloadable evaluation version of the current release of HomeDoor. The HomeDoor pages are at http://www.opendoor.com/homedoor/. General information on Open Door Networks, one of the first Macintosh-based Internet service providers, is available at http://www.opendoor.com. Specific questions should be addressed to help@opendoor.com.

[For those of you that would like to see a real life example of this technology, we use HomeDoor on one of our servers in the Xplain Corp./MacTech offices. In fact, the www.mactech.com and www.devcentral.com web sites are redirected using HomeDoor. This allows us to have an all Macintosh Internet site without having to resort to Unix. We're very pleased with this solution.

There are some minor limitations to the way that HomeDoor works (although it does benefit from an all Macintosh user interface). If you want a different solution, Unix does offer the most complete "multi-homing" solution available. And, if you want to stay with the Macintosh (and why wouldn't you?), then MachTen from Tenon is your answer – it's a kinder, gentler Unix. :) – Pub. nst]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INTERNET DEVELOPMENT

By Mason Hale <hale@onr.com>

CGI's: AppleScript or Frontier?

Comparing scripting environments for CGI development

In a previous article, "Scripting the Web with Frontier", I introduced you to writing CGI scripts using UserLand Frontier. In that article, I argued that Frontier was an excellent alternative for webmasters who felt forced to choose between the poor performance of AppleScript and the steep learning curve of C because Frontier is easier to use than C yet generally performs faster than AppleScript, especially when used to create CGI applications. That argument became even more true when a PowerPC-native Frontier was released for public beta-testing in late October. Like dropping a bigger engine into a hot rod, script execution instantly becomes much faster – in some cases up to six time faster. With this boost in speed on PowerPC machines, Frontier is closing the gap on C – offering both ease-of-use and excellent performance – while further increasing its lead on AppleScript.

Despite the proven benefits of using Frontier to write CGI applications, many webmasters still are developing their CGIs in AppleScript. This inspired me to look a bit more closely at the differences between CGI applications written in Frontier and those in AppleScript, primarily focusing on performance issues. In this article I will share the results of some of my recreational performance testing, and explain some of the different situations that affect performance.

Since I am the author of the Frontier CGI Framework, a set of scripts that enhance CGI development in Frontier, you could understandably question my objectivity in doing such a comparison. On the other hand, since I have done a great deal of CGI development in both environments, I am also one of the few people qualified to do such a comparison. In either case it is not my intent to discount AppleScript as a scripting environment. I think it is a great product and an important technology. I just don't believe it is well-suited to the specific task of CGI development.

PERFORMANCE

Performance is crucial to CGI applications running on busy servers. The more processing time a request takes, the more likely a user is to give up and move on to another site.

I've often been asked if Frontier is faster than AppleScript. The truth is, when comparing built-in verbs in AppleScript and the non-native version of Frontier, the performance is surprising similar. I ran a series of informal tests to compare the performance of AppleScript, non-native Frontier and native Frontier when running equivalent scripts. The scripts are based on the sample scripts from Frontier's object database. All tests were run on a Power Macintosh 7200/75 with 16 MB RAM. Execution time is measured in ticks (sixtieths of seconds).

The first test script performs simple integer arithmetic using built-in commands in both the AppleScript and UserTalk versions. The actual scripts are functionally identical.

Test 1: Integer Arithmetic (AppleScript)

```
set x to 0
repeat with i from 1 to 1000
```

Mason Hale – Mason Hale is Director of Internet Services for VersaCom, Inc. – an Austin, Texas-based on-line communications and Internet marketing firm. He is the author of the Frontier CGI Framework and President of the Capitol Macintosh Users Group.

```
  set x to x + (12 + 99 - 37 / 84)
end
```

Test 1: Integer Arithmetic (UserTalk)

```
x = 0
for i = 1 to 1000
  x = x + (12 + 99 - 37 / 84)
```

AppleScript took 111 ticks to complete the first test, while the non-native Frontier took 103 ticks. The PowerPC-native Frontier ran the same script in just 17 ticks. This first test really shows how close the non-native Frontier and AppleScript were – and the tremendous difference the native version makes.

The second test demonstrates the repeated calling of a local subroutine.

Test 2: Subroutine Call (AppleScript)

```
set y to 10
on moof (x)
  return (x * 2)
end
repeat with i from 1 to 1000
  set y to moof (y)
end
```

Test 2: Subroutine Call (UserTalk)

```
y = 10
on moof (x)
  return (x * 2)
for i = 1 to 1000
  y = moof (y)
```

AppleScript blew the doors of the non-native Frontier in the second test coming in at 85 ticks to Frontier's 272 ticks. However, the PowerPC-native Frontier handily won with a time of 47 ticks.

The third script compares the performance of commands from an external Scripting Addition to a built-in Frontier verb. I compared the speed of Frontier's built-in clock.now verb to the equivalent current date Scripting Addition.

Test 3: Built-in verb vs. Scripting Addition (UserTalk)

```
for i = 1 to 100
  y = clock.now ()
```

Test 3: Built-in verb vs. Scripting Addition (AppleScript)

```
repeat with i from 1 to 100
  set y to current date
end repeat
```

It took AppleScript 113 ticks to complete this test, while the non-native Frontier took 17 ticks and the native Frontier took 5 ticks. This illustrates a crucial point in determining the speed of a script. Built-in commands are faster than commands loaded from external code fragments. Because AppleScript has few built-in verbs and relies heavily on Scripting Additions to extend the language, the use of external commands like "current date" is quite common.

In the fourth example the script checks the existence of a file. Frontier uses a built-in verb "file.exists", while AppleScript communicates with the scriptable Finder via AppleEvents.

Test 4: Built-in verb vs. Apple Event (AppleScript)

```
set x to 0
tell application "Finder"
  repeat with i from 1 to 10
    if exists alias "Macintosh HD:SimpleText" then
      set x to x + 1
    end if
  end repeat
end tell
```

Test 4: Built-in verb vs. Apple Event (UserTalk)

```
local (x = 0)
for i = 1 to 10
  if file.exists ("Macintosh HD:SimpleText")
    x++
```

Inter-application communication can really slow things down. Each cross-application Apple Event adds approximately 1/4 second to the processing time of the script. Frontier suffers the same slowdowns when sending Apple Events to other applications, but because more commands are available, external applications are relied on less often.

The results of the fourth test bear this out. While the native and non-native Frontier applications finished in 3 ticks and 7 ticks respectively, AppleScript took 140 ticks to perform the same task using the scriptable Finder.

My final test was "real world" example, based on the "test.cgi" script that is distributed with MacHTTP. This script uses no scripting additions and doesn't perform any cross-application communication. So it is a pretty good example of a common CGI script using built-in verbs.

Test 5: Test CGI (AppleScript)

```
property crlf : (ASCII character 13) & (ASCII character 10)

--this builds the normal HTTP header for regular access
property http_10_header : "HTTP/1.0 200 OK" & crlf & ¬
  "Server: MacHTTP" & crlf & "MIME-Version: 1.0" & ¬
  crlf & "Content-type: text/html" & crlf & crlf

on cgiScript (path_args, http_search_args, username, ¬
  password, from_user, client_address, server_name, ¬
  server_port, script_name, content_type, referer, ¬
  user_agent, action, action_path, post_args, method, ¬
  client_ip, full_request)

  try --wrap the whole script in an error handler
    return http_10_header & "<title>Test CGI</title>" & ¬
      "<h2>Test CGI</h2><u>CGI arguments sent:</u>" & ¬
      "<br><b>path:</b> " & path_args & ¬
      "<br><b>search:</b> " & http_search_args & ¬
      "<br><b>post_args:</b> " & post_args & ¬
      "<br><b>method:</b> " & method & ¬
      "<br><b>address:</b> " & client_address & ¬
      "<br><b>user:</b> " & username & ¬
      "<br><b>password:</b> " & password & ¬
      "<br><b>from:</b> " & from_user & ¬
      "<br><b>server_name:</b> " & server_name & ¬
      "<br><b>server_port:</b> " & server_port & ¬
      "<br><b>script_name:</b> " & script_name & ¬
      "<br><b>referer:</b> " & referer & ¬
      "<br><b>user agent:</b> " & user_agent & ¬
      "<br><b>content_type:</b> " & content_type & crlf
  on error msg number num
    return http_10_header & "Error " & num & ", " & msg
  end try
end caller

repeat with i from 1 to 10
cgiScript ("aaa", "bbb", "ccc", "ddd", "eee", ¬
  "fff", "ggg", "hhh", "iii", "jjj", "kkk", ¬
  "lll", "mmm", "nnn", "ooo", "ppp", "qqq", "rrr")
end repeat
```

Test 5: Test CGI (UserTalk)

```
on cgiScript (pathArgs, httpSearchArgs, username, \
  password, fromUser, clientAddress, serverName, \
  serverPort, scriptName, contentType, referer, \
  userAgent, action, actionPath, postArgs, method, \
  clientIp, fullRequest)

  try
    return (webServer.httpHeader () + \
      "<title>Test CGI</title><h2>Test CGI</h2>" + \
      "<u>CGI arguments sent:</u>" + \
      "<br><b>path:</b> " + pathArgs + \
      "<br><b>search:</b> " + httpSearchArgs + \
      "<br><b>post_args:</b> " + postArgs + \
      "<br><b>method:</b> " + method + \
      "<br><b>address:</b> " + clientAddress + \
      "<br><b>user:</b> " + username + \
      "<br><b>password:</b> " + password + \
      "<br><b>from:</b> " + fromUser + \
      "<br><b>server_name:</b> " + serverName + \
      "<br><b>server_port:</b> " + serverPort + \
      "<br><b>script_name:</b> " + scriptName + \
      "<br><b>referer:</b> " + referer + \
      "<br><b>user agent:</b> " + userAgent + \
      "<br><b>content_type:</b> " + contentType + cr + lf)
  else
    return (webServer.httpHeader () + "Error " + tryError)

local (i)
for i = 1 to 10
  cgiScript ("aaa", "bbb", "ccc", "ddd", "eee", "fff", "ggg", \
    "hhh", "iii", "jjj", "kkk", "lll", "mmm", "nnn", "ooo", \
    "ppp", "qqq", "rrr")
```

As expected, the AppleScript and non-native version of Frontier performed similarly. The AppleScript CGI test finished in 69 ticks, beating out Frontier at 74 ticks. Native Frontier won again with 14 ticks. A summary of the timing results for all tests is shown in Table 1.

	AppleScript	Frontier 68K	Frontier PPC
Integer Arithmetic	111	103	17
Subroutine Call	85	272	45
Built-in vs. OSAX	113	17	5
Built-in vs. AE	140	7	3
Test CGI	69	74	14

Table 1. Comparison of execution times (all times in 1/60 second)

Multi-threading

Beyond straight script execution, another factor can significantly affect the speed at which a given script runs: multi-threading. In the exponentially-growing world of the internet, it is common for the average web server to receives thousands of requests a day. It is also quite likely that two clients will request the exact same file at the exact same time. If the requested file happens to be your CGI script, it will have to deal with two concurrent requests.

AppleScript is not multi-threaded, and handles multiple concurrent requests by placing them into a queue. Unfortunately, AppleScript processes events on a last-in first-out basis – so the latest event received is the first to be processed. To put it another way, on a very busy server, the first person to call the CGI may very well be the last person to receive the results. This can result in every single request timing out if new requests keep forcing older ones further back in the queue.

Frontier is fully multi-threaded. Every new request spawns a new thread automatically. This means that incoming event are processed immediately and do not prevent processing of earlier requests.

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A more subtle, but still important performance consideration is the fact that all Frontier-based CGI's are hosted by a single application. In the cooperative multi-tasking Mac OS, applications must cooperatively share processing time. Adding a new, separate application for each CGI creates more overhead to manage the sharing of processor time among the competing applications and eventually slows down all the applications. Consolidating all CGI scripts into Frontier's object database eliminates this overhead.

CONCLUSION

Being PowerPC-native and multi-threaded clearly gives Frontier the performance advantage over AppleScript. However, even if AppleScript were multi-threaded and native, its reliance on Scripting Additions and external applications to perform its functions severely limit performance, and thus limit its usefulness as a development environment for CGI applications.

URL's

Native Frontier Public Beta release: http://www.hotwired.com/userland/yabbadabba/nativefrontierpublicbe_390.html
Frontier CGI Scripting: http://www.webedge.com/frontier/
Aretha Website: http://www.hotwired.com/userland/aretha/

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Gentlepersons,

Thank you for the support that you have shown to cross-platform development in the last year.

It was a fun year for me, as Microsoft's evangelist to the Macintosh software development community. From the popular free seminars on "Windows 95 Programming for Mac Developers" at last January's MacWorld Expo, through MacHack, and on-line, I have enjoyed working with Mac developers in their explorations of Windows 95 and Windows NT.

During that time, cross-platform support from previously Mac-only software companies has increased dramatically, with new releases of Object Master and 4th Dimension for ACIUS, ClarisDraw and ClarisWorks from Claris, Ray Dream Designer from Ray Dream, KPT Convolver from HSC, MacFlow from Mainstay, SimTown from Maxis, Metrowerks' CodeWarrior 7 x86-targeting cross-compiler, Route 66 from Route 66, and many, many others. In case no one has said it yet: thanks! Your applications make Windows better, and I am grateful for your support.

At the same time, Microsoft is helping previously Windows-only software developers move their applications to the Macintosh – and make cross-platform development easier for everyone – with our recently-released Visual C++ 4.0 Cross-Development Edition for the Macintosh and Power Macintosh.

This cross-platform support improves the experience of end-users, who can now use their favorite applications on the platform of their choice. Hopefully Microsoft, Apple, and our mutual third-party developers will continue to find new and innovative ways to work together to improve the end-user experience.

In all of this, I have enjoyed the friendship and camaraderie of a significant part of the Macintosh development community, and for that, especially, I thank you.

Looking forward to another great year of helping cross-platform developers, I remain

Yours,

James Plamondon
Technical Evangelist
Microsoft Developer Relations Group

P.S.: If you'd like to investigate supporting Windows in addition to the Mac, please check out Microsoft's Web site: http://www.microsoft.com.

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BOOK REVIEW

By John R Powers, III, guideWorks, LLC

New Apple Guide Authoring Aids

Three books and accompanying software for Apple Guide authoring

Apple Guide Complete: Designing and Developing Onscreen Assistance
By Apple Computer, Inc.
Addison-Wesley (0-201-48334-3)
$39.95. 554 pages.

Real World Apple Guide
By Jesse Feiler
M&T Books (1-55851-429-5)
$39.95. 411 pages.

Danny Goodman's Apple Guide Starter Kit
By Danny Goodman and
Jeremy Joan Hewes
Addison-Wesley (0-201-48349-1)
$34.95. 295 pages.

Apple Guide authoring just got a lot easier. Three new books and accompanying software make it that way. If you already know about Apple Guide, skip to the next section. Otherwise, hang on and I'll give you a quick introduction. [For more on Apple Guide, see the March and July '95 *MacTech Magazine*.]

INTRODUCING APPLE GUIDE

Apple Guide is the exciting help system that comes with System 7.5. It enables users to accomplish tasks with minimal directions. It actively leads users through the steps required to complete desired tasks. For example, let's pretend you make fax software. You may use Apple Guide to lead your user through the steps to send a fax, including how to set up the address, cover page, and scheduling transmission. You do this by creating a guide file that interacts with the user step-by-step. The guide file checks the user's context and presents only the necessary information. It also automates many of the steps via AppleScript, and uses Apple Guide's unique "coach marks" to highlight live interface elements so that users can simply point-and-click their way through the process. Your users are happier and your customer support line is less busy.

With the recent release of version 2.0, Apple Guide technology is available from System 7.0 on up; and it will be a key part of Active Assistance in Copland. More and more applications are including guide files. Third party developers like the way it gives them a competitive advantage and reduces the load on customer support. Major corporate users like how it streamlines the work flow and how it reduces the load on the help desk.

AUTHORING APPLE GUIDE

One authors Apple Guide by combining content and instructions into a guide file. The current guide authoring tools are *Guide Maker*, *Guide Composer*, and Danny Goodman's *Apple Guide Starter Kit*.

Guide Maker is the original Apple Guide authoring tool developed by Apple. It's five tools in one: build guide files, test look-for, diagnose guides, convert WinHelp, and import/export for localization. *Guide Maker* uses Guide Script as its means for "programming" guide files. Guide Script is a mark-up language; the author writes the guide content and tags the content with Guide Script. There are about 100 commands that control startup parameters, formats, sorting, sequences, and much more.

Guide Composer and Danny Goodman's *Apple Guide Starter Kit* (the latter included with his book, discussed in this article) are two new tools that provide a WYSIWYG interface to guide authoring. Both of them output Guide Script for automatic compilation by Guide Maker Lite, a special version of Guide Maker without a user interface.

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NEW AUTHORING AIDS

The new books and accompanying software are:

Apple Guide Complete: Designing and Developing Onscreen Assistance

This is Apple's own Apple Guide book, written by Apple's Developer Press. Think of it as the Apple Guide *Inside Mac*, 2nd Edition, for guide authors. It provides authoring tips and suggestions, describes how to use Guide Maker and Guide Script, and documents the Apple Guide API.

Apple Guide Complete includes a CD-ROM with lots of Apple Guide material, including Apple Guide, Guide Maker, sample guide files, sample source files, sample context checks, the Apple Guide interface files and libraries, and a searchable command reference to all Guide Script commands. The CD-ROM does not contain the latest release of Apple Guide (2.0), Guide Maker (1.2.7), or Guide Maker Lite (1.2.5); those you'll have to get from Apple's ftp site, Apple's Developer CD, or the Mac OS SDK.

Real World Apple Guide

This book covers much of the same material as in *Apple Guide Complete*, but with an emphasis on actually using Apple Guide to solve problems. Think of it as Jesse's Handy Guide to Using Apple Guide. It contains the prerequisite chapters on Apple Guide, Guide Maker, Guide Script, and the API, but also includes chapters on creating guide files for use with common frameworks and applications. For example, it describes how to add Apple Guide to MacApp and 4th Dimension.

An accompanying CD-ROM includes Apple Guide, Guide Maker, and related files. It also includes lots of demos, and a cookbook which comprises shells, guide script examples, and code examples. Like *Apple Guide Complete*, the CD-ROM does not contain the latest releases.

Danny Goodman's Apple Guide Starter Kit

This book takes a completely different approach from the other two. Danny starts the reader immediately authoring guide files using his Starter Kit software. It's a very "hands on" approach that quickly produces a guide file from Danny's WYSIWYG interface. Once you learn how to use the authoring tool, Danny and his co-author, Jeremy Hewes, introduce design concepts and advanced topics.

The book includes a floppy disk with the Guide Starter software, Guide Maker Lite, a sample application, and support files. Apple Guide and Guide Maker are not included, nor are they necessary since Apple Guide is in System 7.5 and Guide Maker Lite is the only compiler Danny's software needs.

COMPARISONS

We'll attempt to help you sort out the possibilities by providing a couple of different ways to compare the books.

Who is the reader?

Third party developers use Apple Guide create guides for their applications. All three books cover this.

Solution providers use Apple Guide to develop custom guides for end users. While ways to do this can be inferred from any of the three books, only *Real World Apple Guide* includes specific information on creating guides for common third party applications and frameworks.

Application software engineers need information on how to support Apple Guide within their applications. *Apple Guide Complete* and *Real World Apple Guide* provide API documentation for this.

How well do they support the development process?

Creating Apple Guide files requires a seven-step process: task analysis, instructional and visual design, writing content, scripting, application integration, testing, and localization. Let's examine how each book supports each step in the development process.

- **Task analysis**: identifying and articulating the tasks that the user must accomplish. This is a very difficult step, but essential for Apple Guide's task-oriented design. Conclusion: zip for all three. None of the books provide help in this essential area.
- **Instructional and visual design**: specifying how the guide will support the user's tasks. Conclusion: all three books provide good coverage of this area. *Apple Guide Complete* provides the most information on design.
- **Writing content**: creating the words and images to support the instructional and visual design. Also includes all the indexing of the guide topics for the Apple Guide's search engine. Conclusion: *Apple Guide Complete* and Danny Goodman's book provide information on this area. *Apple Guide Complete* also covers the difficult area of indexing.
- **Scripting**: wrapping the Guide Script around the content. This includes all the sequencing of steps, context checking, and automation. Conclusion: All three books provide ample coverage of this difficult step in the process. None of the books cover automation scripting using AppleScript, though.
- **Application integration**: Apple Guide does not require that the application it supports be changed in any way, but if you can change it, you can really improve the user interaction. Application integration adds code to the application to support the guide. Conclusion: *Apple Guide Complete* and *Real World Apple Guide* provide reference material for application integration. *Real World Apple Guide* also provides detailed integration information for MacApp.
- **Testing**: guide files must be tested like any other complex software. Conclusion: *Apple Guide Complete* provides a little information.
- **Localization**: guide files, like the applications they support, must serve an international market. The guide content must be localized. Conclusion: *Apple Guide Complete* provides a little information.

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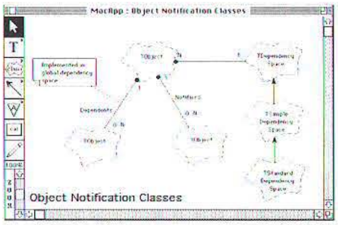
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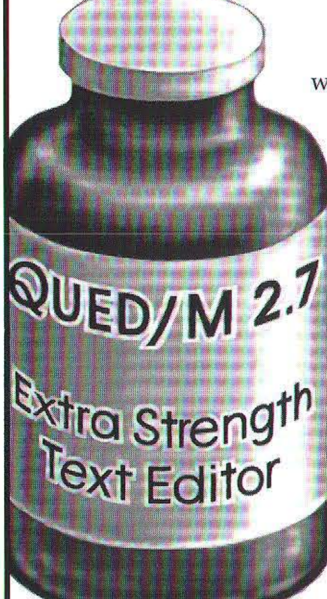

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By Eric Soldan, Apple Developer Technical Support

OpenDoc: Contain Yourself ...

Updating applications to work with OpenDoc

It's time to be an OpenDoc™ container application. It's not too soon, and it's not too late. So how do you decide if your application should be an OpenDoc container application or not? Here's an easy test:

- Will your application benefit from Internet access?

If the answer is yes, then being an OpenDoc container application is probably the right thing to do. By becoming an OpenDoc container application, you automatically get the benefits of everything that is OpenDoc, including CyberDog, which will provide component oriented Internet clients and other Internet services. Now is not the time to ignore the Internet bandwagon. It's worth jumping on. The only question remaining is how to jump. Do you learn Open Transport and MacTCP and recode your entire application to support the Internet? Or do you look for alternatives, like OpenDoc?

A logical question therefore would be: "Is OpenDoc really the fastest way to add Internet to your application?" Adding Internet support with OpenDoc boils down to adding basic OpenDoc support; in this article we will evaluate the difficulty of adding OpenDoc to an existing application. Then you can decide.

THE CONTAINER APPLICATION LIBRARY: YOUR FRIEND.

CALib, the Container Application Library, has been evolving for a while. It's looking really good right now. Joshua Susser, of OpenDoc engineering, and I have been adding CALib support to an application I originally developed in Developer Tech Support called DTS.Draw. I wrote DTS.Draw years ago, without ever considering the possibility of adding something like OpenDoc later. DTS.Draw's document model, while flexible, is a closed model, so adding OpenDoc support is therefore a very interesting test case for CALib.

It turns out that the amount of additional coding necessary is minimal. However, due to CALib's flexibility, there were many development issues that had to be discussed for quite a while. If these discussions were not held, the implementation would not have been as robust. I will present what we've learned from these discussions.

First, let's talk about DTS.Draw for a while. When adding OpenDoc, it's important to understand how the existing application works. Since you are probably not familiar with DTS.Draw, I'll give you a quick overview.

DTS.Draw is an AppsToGo framework based application. AppsToGo is an object-oriented C framework written by DTS. DTS.Draw is also all C code. DTS.Draw is a "standard" drawing application. It has a tool palette of a variety of drawing objects. It has a hierarchical document architecture which allows for grouping and ungrouping of draw objects. It supports infinite undo. It supports drag and drop.

Eric Soldan – Eric Soldan is a seven year veteran in Apple DTS and an Apple short-timer. Once this is done, he'll turn in his badge and start his new life as a developer person. Yep – he's doing the startup thing. (Yawn...) His new company is called 6prime. (You may have already seen him quoted on the 11/6 cover of MacWeek as president of 6prime. And no, he didn't get a mug for the info.) 6prime will specialize in OpenDoc development and Windows-to-Mac porting.

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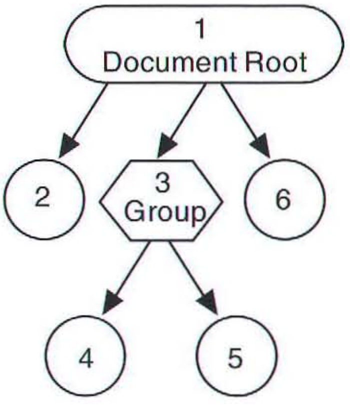
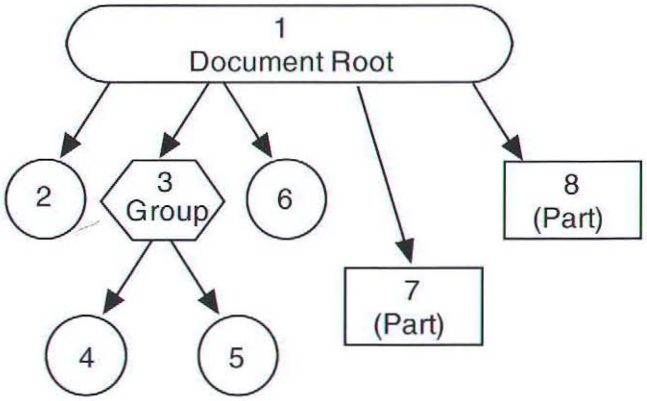
When a document is saved, the object hierarchy is flattened and streamed to the file. When a drag-out occurs, the selected objects are streamed into a handle; this stream represents a sub-hierarchy of the document. This sub-hierarchy is then just a flavor for the clippings file. When a file is opened (or a drag-in occurs), the hierarchy is reconstructed. Very standard stuff.

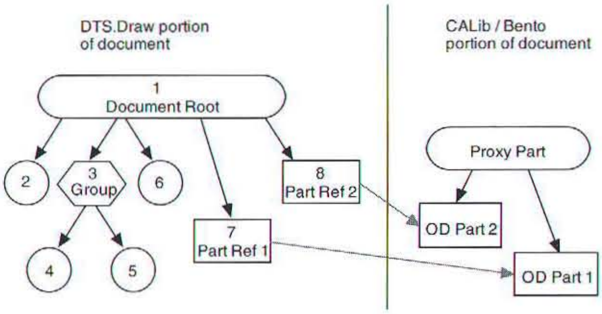
Here's a diagram of a representative DTS.Draw document:



For a save, the objects in the hierarchy are streamed in simple tree-walk order, as indicated by the numbering. The drag objects 2, 4, 5, and 6 can be any supported object. The current implementation of DTS.Draw allows for line, rect, round rect, oval, and pie objects. More can be added of course, and this exactly is how we added OpenDoc support to DTS.Draw; we just added a new OpenDoc Part object into the application. The difference with this object is that the content isn't anything specifically manipulated by DTS.Draw. It is simply a part the user adds to the document. The DTS.Draw object just serves as a "container" for the OpenDoc part. If a user were to add two OpenDoc parts to the above DTS.Draw document, the document hierarchy might end up looking something like:



The implementation in DTS.Draw is relatively simple. The Part object inherits from DTS.Draw's native rect object. The difference is that it has a much more complex content that the rect object in the standard DTS.Draw application. The content of the Part object can be any OpenDoc part, of course. The content of the Part object is managed using CALib. Given this information, look at this diagram and see exactly what the relationship between the Part objects and CALib :



As shown above, there's a lot more to the DTS.Draw document now. Fortunately, most of the new stuff is managed by CALib and OpenDoc. CALib uses a "proxy part" to contain the parts that are placed into the document content. Normally, OpenDoc expects there to be a root part that is an OpenDoc container, but since other parts are "embedded" into your application's non-OpenDoc document, a proxy container part is created and the "embedded" parts are stored in there. The proxy part, as far as OpenDoc is concerned, is what actually contains the other parts that are referenced from the DTS.Draw native content.

The difficulty here is that the proxy part isn't "real." It has no geometry information, and OpenDoc doesn't automatically bind the proxy part to any code, as is the normal case with OpenDoc parts. Thus, OpenDoc is unable to offer the full range of services for the embedded parts. But this is okay. The proxy part isn't all that smart, nor should it be. It is simply a part that is used by CALib to have somewhere to put the other parts.

So it's up to DTS.Draw to control the layout and presentation for the OpenDoc parts. Only the application knows the geometry information for the embedded parts, which is stored in DTS.Draw Part objects. The DTS.Draw Part object also has a persistent reference to the corresponding object embedded in the proxy part. Fortunately, CALib offers API calls to help manage these and other OpenDoc interactions, so the above and other OpenDoc related tasks are relatively simple to implement.

For example, to perform screen updates and such, DTS.Draw simply tells CALib to tell the part to draw itself. All that is needed is the Part Ref value, which indicates to CALib which embedded part to draw. The application doesn't have to care what it references. It references something, and that thing knows how to draw itself.

STREAMING YOUR OBJECTS

Given that the proxy part can't really deal with containing parts by itself, (i.e., without your application doing the geometry), the proxy part and its embedded parts do not constitute a valid OpenDoc document. This is important when we decide what type of document you want to create when you save it to disk.

The choices are:

1. A Bento stream placed inside your document.
2. Your document stream placed inside a Bento document.

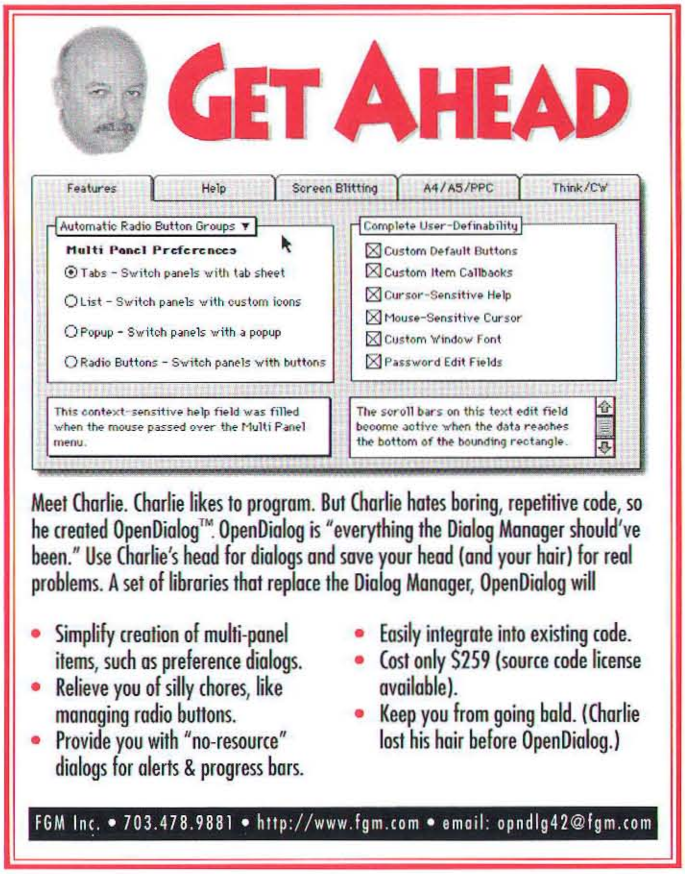
The right choice will of course depend on your application. For DTS.Draw, we chose 1. Choice 1 is closer to existing Macintosh applications. Choice 2 is closer to regular OpenDoc parts. If you were to consider the development choices, from application to OpenDoc part, with CALib applications somewhere in between, your choices look something like this:

Application:
Standard document architecture.

CALib-friendly application:
Standard document architecture with embedded Bento stream.

CALib-savvy application:
Bento document with application data streamed into an OpenDoc storage unit value.

OpenDoc part editor:
Bento document with part editor data residing in an OpenDoc storage unit.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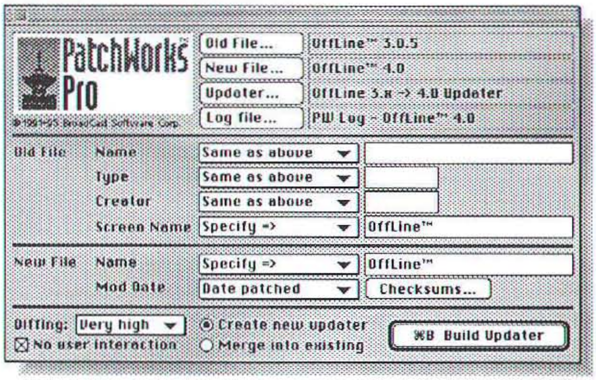

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Log file... PW Log - OffLine™ 4.0

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When considering drag and drop, the above categories are very important. When applications drag something to the desktop, a clippings file is created. When OpenDoc parts are dragged to the desktop, an OpenDoc document is created, instead of a clippings file. This is an important distinction between applications and OpenDoc. Applications create clippings files because they are a standard and flexible intermediate format. OpenDoc parts create OpenDoc documents on a drag-out because an OpenDoc document is already a universal format. There's no reason to resort to creating a clippings file.

If you are a CALib application, the choice is no longer so clear. Our suggestion is to base your drag-out decision on whether your document format is still "native," or if you use a Bento file with your native content embedded.

So, if you are a CALib application, what is one to do on a drag-out? The answer lies in the document type. If the document type is an OpenDoc document (CALib-savvy), then the drag-out type is OpenDoc document. If the document type is a standard document (CALib-friendly), then the drag-out type is a clippings file.

DTS.Draw's native content is simply streamed out. After adding CALib support, this is still the case. The Bento document is streamed out, as well. Here's the new document format:

Byte offset	**Description**
0 to 3:	length of Bento stream
4 to nativeContent - 1:	Bento stream
nativeContent to EOF:	native content stream, i.e., DTS.Draw old format

There was much discussion as to whether or not the Bento stream should be at the front of the file or the end. It turns out that you can do some interesting things if it is at the front of the file. Try out this situation:

1. Your machine has CALib. You add some OpenDoc parts to your DTS.Draw document.
2. You then send the document to some poor individual who doesn't have CALib or OpenDoc.

Guess what? If the Bento stream is in the front of the file, the unfortunate individual can still use the file with your CALib-friendly application. The user without CALib can actually edit the native content and save it out. The native content changes size, but hey, it's on the end of the file.

On machines that don't have CALib but need to display Part objects in their content, the standard look for "NoPart" should be used. This is what OpenDoc displays when an editor for a particular part isn't available. In the case of CALib applications, it works for when CALib isn't available, as well.

Making your CALib-based documents work on machines with or without CALib takes a bit of extra coding, but from a version control standpoint, it is well worth it. Documents can go anywhere. A CALib document can be given to someone without CALib. That this person can actually edit the native content of the document, and then give the document back to you, is pretty nifty.

On machines where CALib isn't available, users obviously won't be able to add any new parts to the document. They will be restricted to editing the native content. However, this may include moving part objects around that someone else was nice enough to put in the document. This works. Remember that the geometry information is stored in the native objects, which all users can edit. The proxy part doesn't handle the geometry. In addition, the user can delete the Part objects (which are displayed using the "No Part" look). This of course means that there is data orphaned in the Bento stream. (Since the user doesn't have CALib, there is no way their machine can modify the Bento stream.) Fortunately, the stream will be compacted the next time the document is saved on a machine with CALib.

With some extra work, you can even allow the user to resize the Part objects without CALib. When this occurs, the information in the Bento stream for that part is no longer up to date. The native content object will need to be flagged as having been resized. When the document is opened on a machine with CALib, these objects will need to have their frame information renegotiated and resolved to reflect their new size.

We've been discussing types of editing that can still occur to a CALib document Part object when CALib isn't available. There are, of course, edits that can't be performed. Here are two:

1. Dragging that includes a Part object. Streaming the drag data must include streaming the Bento information into the flavor. This can't be done without CALib. All that's in the native object is a persistent reference to somewhere inside the Bento stream. You can't resolve the reference without CALib.

2. Copying the object. At first, it would seem that you would just copy the native content object. It has a persistent reference. Both copies of the object would then point to the same Bento information, i.e., the part. This is a bad thing. When opened again on a CALib machine, each copy of the part should be independent of the other. (You could flag the copy as an unresolved copy, and then clone the object when the document is next opened on a CALib machine.)

As you can see from this discussion, CALib can be used to add OpenDoc capability to your existing applications without radically changing the way they work. The actual amount of code added to an application isn't all that bad, either. Of course, this will vary, depending on architecture and document content, but most likely, it's not a complete recode with major modifications throughout your application. Look for the latest CALib and CASample sample code on the OpenDoc DR4 release.

Have fun out there!

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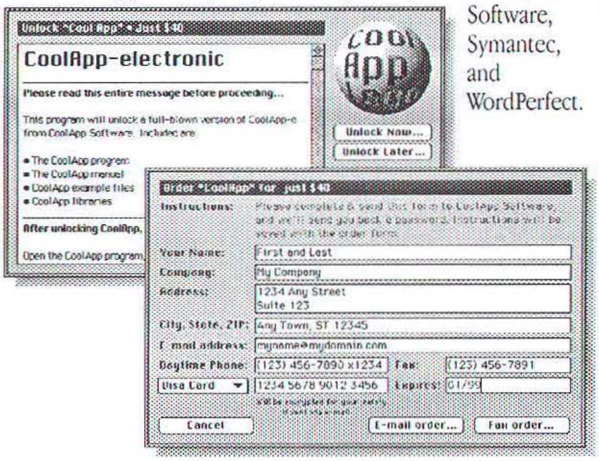

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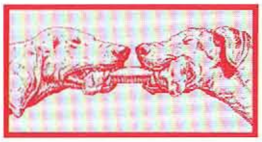

By Bob Boonstra, Westford, Massachusetts

SLIDING TILES

You have all probably seen small versions of the puzzle that is the basis for this month's Challenge: a 4-by-4 grid of interlocking tiles, with one empty tile among the 16 cells allowing the puzzle to be scrambled by sliding adjacent cells into the empty location. This month the Challenge is to write code that will unscramble a larger version of the Sliding Tiles puzzle.

The prototype for the code you should write is:

```
typedef Boolean          /*legalMove*/ (*MoveProc)(
                         /* Callback procedure to move tile at       */
  long tileToMoveRow,    /*  these coordinates into the location     */
  long tileToMoveCol     /*  of adjacent empty tile                  */
);

void SolveTiles(
  long *tiles,         /* pointer to array of tiles where           */
  long numRows,        /*  tile (row,col) is at                     */
  long numCols,        /*  *(tiles + row*numCols + col)             */
  MoveProc MakeMove    /* Callback procedure to move a tile         */
);
```

You will be given a pointer `tiles` into an array of tile values, the number of rows and columns in the puzzle (`numRows` and `numCols`, respectively), and the address of a callback procedure `MakeMove` used to tell my test code about the moves you make to solve the puzzle. The `tiles` array will be initialized with the values `0..numRows*numCols-1`, in an order scrambled by the calling routine. The value `0` represents the empty tile.

Your code should make a sequence of calls to `MakeMove` and return when the puzzle is solved. Each `MakeMove` call exchanges the empty tile with the indicated adjacent tile. The puzzle is solved when you have moved each tile into its proper location: moving the tile with value `i` into location `tiles[i]` (i.e., `row=i/numCols` and `col=i%numCols`).

The callback routine will be something like the code provided below:

```
static long gNumRows,gNumCols;      /* initialized by test code */
static long gEmptyRow,gEmptyCol;    /* initialized by test code */
static long *gTiles;                /* initialized by test code */

#define TileValue(tiles,row,col) *(tiles+(row)*gNumCols+(col))
#define OutOfRange(val,num)  (((val)<0) || ((val)>=(num)))

static Boolean MakeMove(long tileToMoveRow,long tileToMoveCol)
{
  long diff;
  if (OutOfRange(tileToMoveRow,gNumRows)) return false;
  if (OutOfRange(tileToMoveCol,gNumCols)) return false;
  if (tileToMoveRow == gEmptyRow) {
    diff = tileToMoveCol - gEmptyCol;
  } else if (tileToMoveCol == gEmptyCol) {
    diff = tileToMoveRow - gEmptyRow;
  } else {
    return false;
  }
  if ((diff != -1) && (diff != 1)) return false;
  TileValue(gTiles,gEmptyRow,gEmptyCol) =
    TileValue(gTiles,tileToMoveRow,tileToMoveCol);
  gEmptyRow = tileToMoveRow;
  gEmptyCol = tileToMoveCol;
  TileValue(gTiles,gEmptyRow,gEmptyCol) = 0;
}
```

As an example, given the initial conditions:

```
long tiles[] = {1,4,0,3,5,2};
SolveTiles(tiles,2,3,MakeMove);
```

... you could generate the following moves:

```
MakeMove(1,2);
MakeMove(1,1);
MakeMove(0,1);
MakeMove(0,0);
```

THE RULES

Here's how it works: Each month we present a new programming challenge. First, write some code that solves the challenge. Second, optimize your code (a lot). Then, submit your solution to MacTech magazine. We choose a winner based on code correctness, speed, size, and elegance (in that order of importance) as well as the submission date. In the event of multiple equally desirable solutions, we'll choose one winner (with honorable mention, but no prize, given to the runner up). The prize for each month's best solution is a $100 credit in the MacTech Mail Order Store and a limited-edition, "The Winner! MacTech Programmers Challenge" T-shirt (not available in stores anywhere).

Unless stated otherwise in the problem statement, the following rules apply: All solutions must be in ANSI compatible C. Use only pure C code. We disqualify entries with any assembly in them (except for challenges specifically stating otherwise). You may call any Macintosh Toolbox routine (e.g., it doesn't matter if you use NewPtr instead of malloc). We test entries with compiler options set to disable FPU use (for 680x0 code) and to enable all available speed optimizations. The compiler to be used and the target instruction set (680x0 or PowerPC) will be stated in the problem. **Limit your code to 60 characters per line;** this helps with e-mail gateways and page layout.

We publish the solution and winners for each month's Programmer's Challenge two months later. All submissions must be ***received by*** the 10th day of the month printed on the front cover of this issue.

You can get a head start on the challenge by reading the online version. We post it to the online services at the same time that we post source code. We make every effort to have it online no later than when the magazines are mailed, but we're unable to guarantee that it will be online by any given date.

Mark solutions "Attn: Programmer's Challenge Solution" and send it by e-mail to one of the Programmer's Challenge addresses in the "How to Communicate With Us" section on page 2 of this issue. Include the solution, all related files, and your contact info.

MacTech Magazine reserves the right to publish any solution entered in the Programmer's Challenge. Authors grant MacTech Magazine the exclusive right to publish entries without limitation upon submission of each entry. Authors retain copyrights for the code.

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… to transform the puzzle like this:

```
1 4 0  ==>  1 4 2  ==>  1 4 2  ==>  1 0 2  ==>  0 1 2
3 5 2       3 5 0       3 0 5       3 4 5       3 4 5
```

It turns out that half of the possible permutations of the values `0..numRows*numCols-1` are "illegal" in that they cannot be reached from the "solved" state. The calling routine will provide a legal starting state – you don't have to worry about the puzzle being unsolvable.

The number of moves you make to solve the puzzle is not an explicit criterion in determining the winner, but the winner will be determined by total execution time, including the time used by the callback routine, as we did in the Master MindReader challenge a few months back. Note that you are not permitted to optimize the callback routine – its purpose is to provide a fixed time penalty for each move your solution routine makes.

This will be a native PowerPC Challenge, scored using the Symantec 8.0.3 compiler. Good luck. Email me with any questions, or – better yet – join the Programmer's Challenge Mailing List …

MAILING LIST REMINDER

Many Challenge readers have already joined the Programmer's Challenge Mailing List announced last month. The list is being used to distribute the latest Challenge, provide answers to questions about the current Challenge, and discuss suggestions for future Challenges. The Challenge problem is posted to the list sometime between the 20th and the 25th of the month.

To subscribe to the list, send a message to autoshare@mactech.com with the SUBJECT line "sub challenge YourName", substituting your real name for YourName. To unsubscribe from the list, send a message to autoshare@mactech.com with the SUBJECT line "unsub challenge".

TWO MONTHS AGO WINNER

Congratulations to Eric Lengyel (Blacksburg, VA) for submitting the fastest entry to the EnclosingBounds Challenge. The problem was to find the smallest rectangle enclosing all of the non-white pixels in a PixMap. Eight of the 13 entries submitted worked correctly, but Eric's solution was significantly faster than the others. This is Eric's second victory in three months, following his first-place finish in the September Reversible Scrambling Algorithm Challenge.

The winning solution uses a clever technique to minimize the number of comparisons required to find the enclosing rectangle. Rather than test each pixel to determine if it is non-white, Eric logically ORs the values for all pixels in a row (for the indexed color cases), taking advantage of the fact that white is always represented by a zero value. A single comparison then determines whether that row contains only white pixels. Working separately from the top and bottom of the selection rectangle identifies the top and bottom rows of the enclosing rectangle. A similar technique applied to columns finds the left and right boundaries of the rectangle. For the direct (32-bit) color case, the approach is similar, except that pixel values in a row or column are logically ANDed, taking advantage of the fact that white is represented by the value 0x00FFFFFF.

Here are the times and code sizes for each of the correct

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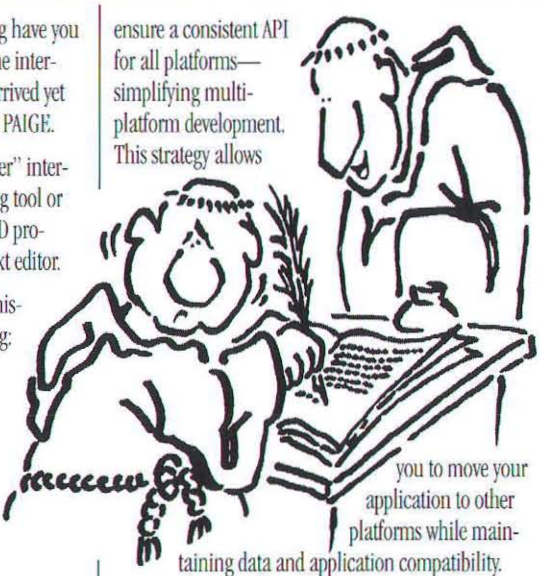

"Say, nice job brother John. Now could you make it a three column format with digital memos embedded in the text stream?"

entries. Numbers in parentheses after a person's name indicate that person's cumulative point total for all previous Challenges, not including this one.

Name	time 1-bit	time 8-bit	time 32-bit	test time	code size	data size
Eric Lengyel (20)	13	66	272	340	1608	320
Ernst Munter (100)	22	96	326	427	2980	32
Miguel Cruz Picao	34	110	476	593	3328	44
John Sweeney	75	145	502	659	4416	624
Bill Karsh (78)	54	135	517	662	1600	8
Tom Saxton	146	170	560	758	1044	132
Chris Rudolph	514	289	973	1354	1420	8
P.L.	6197	4672	5384	11181	656	24

The times listed above were all achieved using the Metrowerks CodeWarrior 7 compiler. Running the winning entry with code generated by the Symantec and MrC compilers (with all speed optimizations enabled in each case) gave some interesting results, with the MrC code executing in 2/3 to 3/4 of the time required by the others:

Compiler (version)	time 1-bit	time 8-bit	time 32-bit
MrC / MPW (1.0f2)	10	52	183
Metrowerks C (1.3.2)	13	66	272
Symantec (8.0.3)	17	75	292

An investigation of the generated code provides some insight into these numbers. CodeWarrior generates the following code for one of the inner loops in the winning solution:

```
          for (i = 0; i < numWholeWords; i++)
00000064: 7D274B78  mr       r7,r9
00000068: 38A00000  li       r5,0
0000006C: 48000014  b        *+20      ; $00000080
          {
             accumulator |= *(long *) k;
             k += 4;
          }
00000070: 80070000  lwz      r0,0(r7)
00000074: 38A50001  addi     r5,r5,1
00000078: 7C630378  or       r3,r3,r0
0000007C: 38E70004  addi     r7,r7,4
00000080: 7C052000  cmpw     r5,r4
00000084: 4180FFEC  blt      *-20      ; $00000070
```

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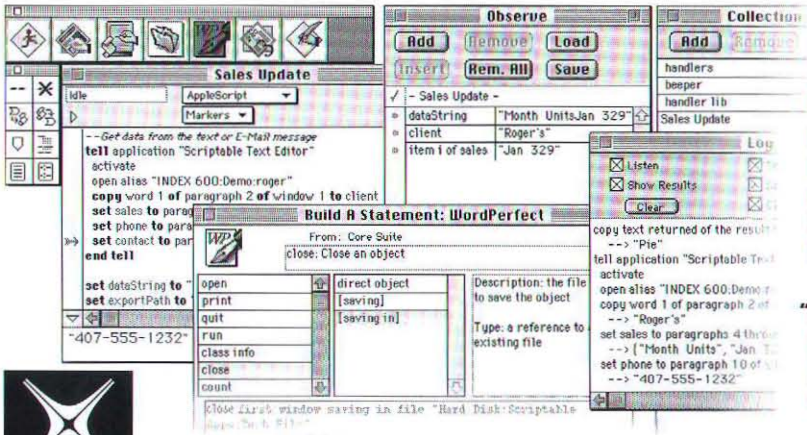

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Scripter 1.0 is top AppleScript editor and debugger... If you expect to do anything more than idle fiddling with AppleScript, you need Scripter." — *MacWeek, 6/12/95*

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By comparison, MrC generates the following longer, but faster code:

```
          for (i = 0; i < numWholeWords; i++)
00F8 006C    48000018   b          $+0x0018        ; 0x00000084
00FC 0070  X 4E800020   blr
0100 0074    31290001   addic      r9,r9,1
0104 0078    7D4A3814   addc       r10,r10,r7
0108 007C  X 7C093000   cmpw       r9,r6
010C 0080  X 4080FFF0   bge        $-0x0010        ; 0x00000070
0110 0084  X 40990028   ble        cr6,$+0x0028    ; 0x000000AC
0114 0088  X 7D0903A6   mtctr      r8              ; CTR = 9
0118 008C  X 2C080001   cmpwi      r8,1
011C 0090  X 4181000C   bgt        $+0x000C        ; 0x0000009C
0120 0094  X 38600001   li         r3,1
0124 0098  X 7C6903A6   mtctr      r3              ; CTR = 9
0128 009C  X 318AFFFC   subic      r12,r10,4
          {
             accumulator |= *(long *) k;
             k += 4;
          }
012C 00A0    846C0004   lwzu       r3,0x0004(r12)
0130 00A4    7C6B5B78   or         r11,r3,r11
0134 00A8  X 4200FFF8   bdnz       $-0x0008        ; 0x000000A0
```

Notice that the inner loop is 6 instructions in the CodeWarrior version but only 3 instructions in the MrC code. The key to the difference is the use of the `mtctr`, `lwzu`, and `bdnz` instructions. The `mtctr` instruction loads the special purpose CTR register, which the `bdnz` instruction decrements and tests, branching when CTR is nonzero (similar to what the DBRA instruction does on 68K machines). The `bdnz` instruction replaces 3 instructions generated by CodeWarrior. The `lwzu` instruction loads a value from memory, but also stores the effective address back into the register used for the indirect memory access, replacing 2 CodeWarrior instructions. Reading disassembled compiler-optimized PowerPC code takes a little practice, but it can provide some insight into what the compiler is doing to you (or for you). Those interested in learning more are referred to the many PowerPC articles in past issues of MacTech, including a two part series by Bill Karsh in August and September of 1994.

TOP CONTESTANTS OF ALL TIME

Here are the Top Contestants for the Programmer's Challenges to date, including everyone who has accumulated more than 20 points. The numbers below include points awarded for this month's entrants.

GET YOUR NAME "IN LIGHTS"

Here at *MacTech Magazine*, we rely heavily on outside writers for most of the material that appears in our pages. If readers did not participate in the magazine, sending us their ideas and taking the time to write articles, there would be no *MacTech*. We like to think of *MacTech* as an ongoing dialogue amongst members of the Mac programming world: we facilitate the discussion, but it's the readers who carry it on, by responding to what they read and to their own programming experiences and interests, in writing. Sometimes we know that we need something specific covered, and we approach someone to write an article on that subject; and we do write a few columns in-house each month. But it is reader contributions, in the form of letters, tips, and especially articles, that give the magazine its relevance, its character, and its appeal.

So *MacTech Magazine* is not a staff of writers sending a constant stream of one-way messages outwards; it's a living, evolving network of readers conversing with one another, educating one another, sharing their knowledge, their experience, their interest, their trials and tribulations and joys and successes in the constantly unfolding story of programming the Macintosh. *MacTech Magazine* doesn't just happen: it's what the community makes it. If we carry reports of future trends and technologies, if we teach useful methods, if we review new books and tools, if we provoke thought, provide help, ride the wave of current interests and concerns, it is only because we reflect the thoughts of our readers, who speak through our pages.

You are invited to involve yourself in this exciting conversation amongst readers. You may be working at the cutting edge of programming technology, as part of a heavily funded professional developer effort; you may be a lone hobbyist wrestling to create shareware for the sheer love of it. You may have been programming the Mac since its inception; you may have just switched over from Windows or Unix. You may work in C or C++ or Pascal or AppleScript, from scratch or in a framework. You may write big apps, small apps, custom solutions, extensions, code segments, for profit, for fun, for education, to solve one problem once. No matter who you are, no matter what your credentials may be, if you have a tale to tell, a trick to share, a technique to teach, we want you to consider joining the family of those who write for *MacTech*.

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Rank	Name	Points	Rank	Name	Points
1.	[Name deleted]	176	11.	Mallett, Jeff	44
2.	Munter, Ernst	110	12.	Kasparian, Raffi	42
3.	Gregg, Xan	81	13.	Vineyard, Jeremy	42
4.	Karsh, Bill	80	14.	Lengyel, Eric	40
5.	Larsson, Gustav	67	15.	Darrah, Dave	31
6.	Stenger, Allen	65	16.	Landry, Larry	29
7.	Riha, Stepan	51	17.	Elwertowski, Tom	24
8.	Goebel, James	49	18.	Lee, Johnny	22
9.	Nepsund, Ronald	47	19.	Noll, Robert	22
10.	Cutts, Kevin	46			

There are three ways to earn points: (1) scoring in the top 5 of any Challenge, (2) being the first person to find a bug in a published winning solution or, (3) being the first person to suggest a Challenge that I use. The points you can win are:

1st place................20 points
2nd place..............10 points
3rd place.................7 points
4th place.................4 points
5th place ....2 points
finding bug ....2 points
suggesting Challenge....2 points

Here is Eric's winning solution:

ENCLOSINGBOUNDS

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```
/*
 This algorithm is based on the following idea. Assuming that we are going to have to
 check many rows or columns which don't contain any non-white pixels, it is faster to
 combine all of the pixels in a row or column and look at the end result than it is to
 check each pixel individually. This is done by ORing entire rows or columns
 together for 1-bit and 8-bit deep pixel maps and ANDing entire rows or columns
 together for 32-bit deep pixel maps. The two different methods are necessary
 because for 1-bit and 8-bit pixel maps, white is represented by zeros and for 32-bit
 pixel maps, white is represented by ones.

 The mask tables below are used with 1-bit and 8-bit deep pixel maps. They are
 needed when the left or right side of the selection rectangle is not word aligned.
*/

long LeftMask1[32] =
   {0xFFFFFFFF, 0x7FFFFFFF, 0x3FFFFFFF, 0x1FFFFFFF,
    0x0FFFFFFF, 0x07FFFFFF, 0x03FFFFFF, 0x01FFFFFF,
    0x00FFFFFF, 0x007FFFFF, 0x003FFFFF, 0x001FFFFF,
    0x000FFFFF, 0x0007FFFF, 0x0003FFFF, 0x0001FFFF,
    0x0000FFFF, 0x00007FFF, 0x00003FFF, 0x00001FFF,
    0x00000FFF, 0x000007FF, 0x000003FF, 0x000001FF,
    0x000000FF, 0x0000007F, 0x0000003F, 0x0000001F,
    0x0000000F, 0x00000007, 0x00000003, 0x00000001};

long RightMask1[32] =
   {0x80000000, 0xC0000000, 0xE0000000, 0xF0000000,
    0xF8000000, 0xFC000000, 0xFE000000, 0xFF000000,
    0xFF800000, 0xFFC00000, 0xFFE00000, 0xFFF00000,
    0xFFF80000, 0xFFFC0000, 0xFFFE0000, 0xFFFF0000,
    0xFFFF8000, 0xFFFFC000, 0xFFFFE000, 0xFFFFF000,
    0xFFFFF800, 0xFFFFFC00, 0xFFFFFE00, 0xFFFFFF00,
    0xFFFFFF80, 0xFFFFFFC0, 0xFFFFFFE0, 0xFFFFFFF0,
```

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```
    0xFFFFFFF8, 0xFFFFFFFC, 0xFFFFFFFE, 0xFFFFFFFF};

long LeftMask8[4] =
   {0xFFFFFFFF, 0x00FFFFFF, 0x0000FFFF, 0x000000FF};

long RightMask8[4] =
   {0xFF000000, 0xFFFF0000, 0xFFFFFF00, 0xFFFFFFFF};

long DirectWhite = 0x00FFFFFF;   // Value of white pixel
                                 // in 32-bit map.
```

EnclosingBounds

```
void EnclosingBounds(PixMapHandle pm,
   Rect selection, Rect *enclosingRect)
{
   PixMapPtr   map;
   long        pixelSize, rowBytes, accumulator,
               leftMask, rightMask, baseAddr,
               leftSide, rightSide, topSide, bottomSide,
               numWholeWords, needLeftMask, needRightMask,
               i, j, k, l, m;

   map = *pm;

/* Compute position of selection rectangle relative to upper-left corner of pixel map. */

   leftSide = selection.left - map->bounds.left;
   rightSide = selection.right - map->bounds.left;
   topSide = selection.top - map->bounds.top;
   bottomSide = selection.bottom - map->bounds.top;

/* Check validity of selection rectangle. */

   if ((rightSide <= leftSide) || (bottomSide <= topSide))
   {
      enclosingRect->left = enclosingRect->right =
         enclosingRect->top = enclosingRect->bottom = 0;
      return;
   }

/* Determine characteristics of pixel map. */

   rowBytes = map->rowBytes;
   if (rowBytes >= 0) pixelSize = 1;   // BitMap
   else pixelSize = map->pixelSize;    // PixelMap
   rowBytes &= 0x3FFF;                 // Strip flags
   baseAddr = (long) map->baseAddr;

/* Handle 1-bit and 8-bit deep pixel maps with same chunk
 of code. 32-bit deep pixel map handled separately. */

   if (pixelSize != 32)
   {

/* Move baseAddr over to the first column of the selection rectangle, still keeping it
 word aligned. Then determine what masks are needed for leftmost and rightmost
 words in the selection and how many whole words there are in between. */

      if (pixelSize == 1)
      {
         baseAddr += (leftSide >> 5) << 2;
         leftMask = LeftMask1[leftSide & 0x1F];
         rightMask = RightMask1[(rightSide - 1) & 0x1F];
         numWholeWords = (rightSide >> 5) -
            ((leftSide + 31) >> 5);
      }
      else
      {
         baseAddr += leftSide & 0xFFFC;
         leftMask = LeftMask8[leftSide & 3];
         rightMask = RightMask8[(rightSide - 1) & 3];
         numWholeWords = (rightSide >> 2) -
            ((leftSide + 3) >> 2);
      }

/* Set flags indicating what masks are in use. If the left and right boundaries of the
 selection fall within the same word, then take the intersection of the left and right
 masks and only consider one column of words. */

      needLeftMask = (leftMask + 1 != 0);
      needRightMask = (rightMask + 1 != 0);
      if (numWholeWords < 0)
      {
         leftMask &= rightMask;
         needRightMask = 0;
      }

/* Find first row with a non-white pixel by ORing the
 whole row together and checking for a non-zero result. */

      j = topSide;
      accumulator = 0;
      m = baseAddr + j * rowBytes;   // Top-left corner
      do
```

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```
      {
         k = m;
         if (needLeftMask)
         {
            accumulator |= (*(long *) k) & leftMask;
            k += 4;
         }
         for (i = 0; i < numWholeWords; i++)
         {
            accumulator |= *(long *) k;
            k += 4;
         }
         if (needRightMask)
         {
            accumulator |= (*(long *) k) & rightMask;
         }
         if (accumulator != 0) break;
         m += rowBytes;
      } while (++j < bottomSide);
      if (j == bottomSide)       // Whole selection is white
      {
         enclosingRect->left = enclosingRect->right =
            enclosingRect->top = enclosingRect->bottom = 0;
         return;
      }
               topSide = j;

/* Find last row with a non-white pixel. */

      j = bottomSide - 1;
      accumulator = 0;
      m = baseAddr + j * rowBytes;    // Bottom-left corner
      do
      {
         k = m;
         if (needLeftMask)
         {
            accumulator |= (*(long *) k) & leftMask;
            k += 4;
         }
         for (i = 0; i < numWholeWords; i++)
         {
            accumulator |= *(long *) k;
            k += 4;
         }
         if (needRightMask)
         {
            accumulator |= (*(long *) k) & rightMask;
         }
         if (accumulator != 0) break;
         m -= rowBytes;
      } while (--j >= topSide);
      bottomSide = j + 1;

/* Find leftmost column containing a non-white pixel. */

      accumulator = 0;
      m = baseAddr + topSide * rowBytes;
      l = 0;
      if (needLeftMask)
      {
         k = m;
         j = topSide;
         do
         {
            accumulator |= (*(long *) k) & leftMask;
            k += rowBytes;
         } while (++j < bottomSide);
         if (accumulator != 0) goto leftFound;
         l += 4;
      }
      for (i = 0; i < numWholeWords; i++)
      {
         k = m + l;
         j = topSide;
         do
         {
            accumulator |= *(long *) k;
            k += rowBytes;
         } while (++j < bottomSide);
         if (accumulator != 0) goto leftFound;
         l += 4;
      }
      if (needRightMask)
      {
         k = m + l;
         j = topSide;
         do
         {
            accumulator |= (*(long *) k) & rightMask;
            k += rowBytes;
         } while (++j < bottomSide);
      }
```

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```
/* When we get to here, we have narrowed down the left-most non-white to the
 word. The value in the accumulator will tell us the exact column of the pixel. We
 then move baseAddr over to the last column of the selection rectangle (word
 aligned). */

leftFound:
      if (pixelSize == 1)
      {
         leftSide = (leftSide & 0xFFFFFFE0) + (1 << 3);
         while (accumulator >= 0)
         {
            leftSide++;
            accumulator <<= 1;
         }
         baseAddr = (long) map->baseAddr +
            (((rightSide - 1) >> 5) << 2);
      }
      else
      {
         leftSide = (leftSide & 0xFFFFFFFC) + 1;
         while ((accumulator & 0xFF000000) == 0)
         {
            leftSide++;
            accumulator <<= 8;
         }
         baseAddr = (long) map->baseAddr +
            ((rightSide - 1) & 0xFFFC);
      }

/* Find rightmost column containing a non-white pixel. */

      accumulator = 0;
      m = baseAddr + topSide * rowBytes;
      l = 0;
      if (needRightMask)
      {
         k = m;
         j = topSide;
         do
         {
            accumulator |= (*(long *) k) & rightMask;
            k += rowBytes;
         } while (++j < bottomSide);
         if (accumulator != 0) goto rightFound;
         l += 4;
      }
      for (i = 0; i < numWholeWords; i++)
      {
         k = m - l;
         j = topSide;
         do
         {
            accumulator |= *(long *) k;
            k += rowBytes;
         } while (++j < bottomSide);
         if (accumulator != 0) goto rightFound;
         l += 4;
      }
      if (needLeftMask)
      {
         k = m - l;
         j = topSide;
         do
         {
            accumulator |= (*(long *) k) & leftMask;
            k += rowBytes;
         } while (++j < bottomSide);
      }
rightFound:
      if (pixelSize == 1)
```

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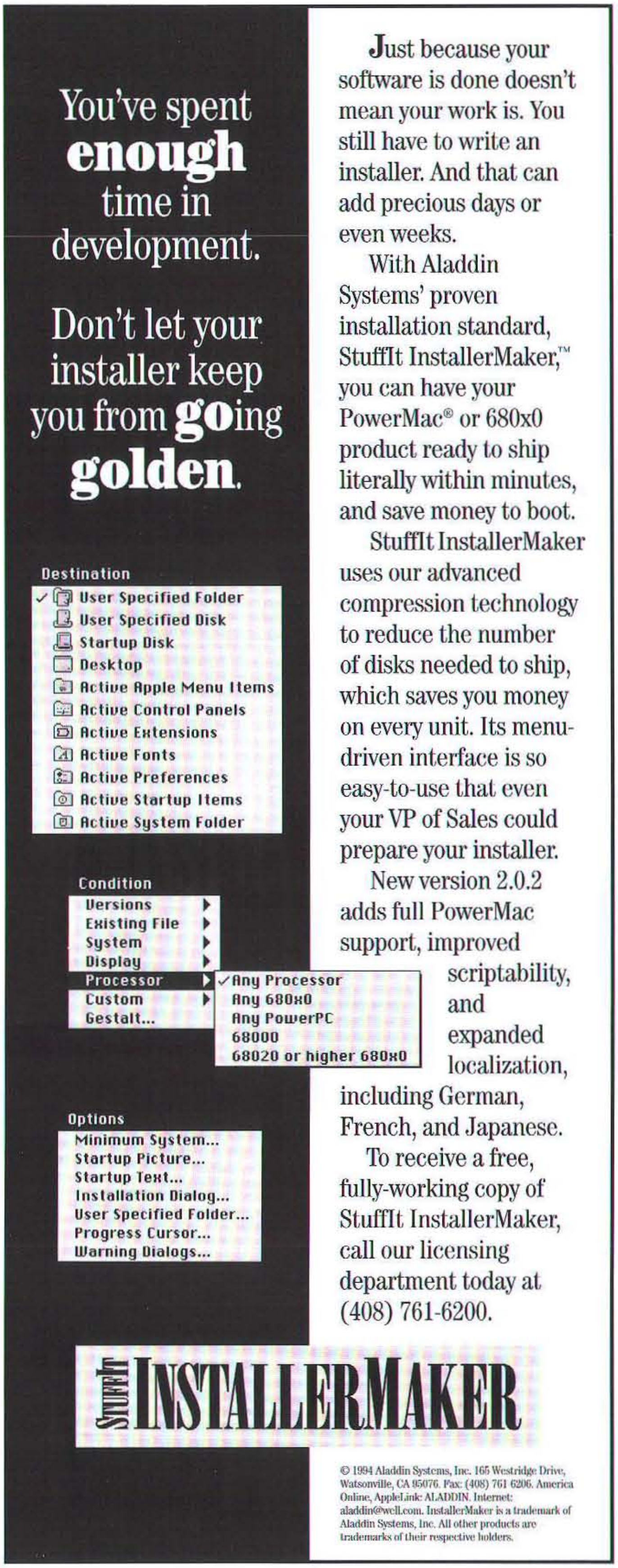

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```
      {
         rightSide = ((rightSide + 31) & 0xFFFFFFE0) - (1 << 3);
         while ((accumulator & 1) == 0)
         {
            rightSide--;
            accumulator >>= 1;
         }
      }
      else
      {
         rightSide = ((rightSide + 3) & 0xFFFFFFFC) - 1;
         while ((accumulator & 0x000000FF) == 0)
         {
            rightSide--;
            accumulator >>= 8;
         }
      }
   }

/* Now for the code which handles 32-bit deep pixel maps.  For direct pixels white is
 ones, unlike indexed pixels where white is zeros.  We will use the same technique,
 but we will have to AND the rows and columns together.  We don't have to worry
 about left and right masks - in 32-bit deep pixel maps every pixel is word aligned.  */

   else
   {
      baseAddr += leftSide << 2;
      numWholeWords = rightSide - leftSide;

/* Find first row.  */

      j = topSide;
      accumulator = DirectWhite;
      m = baseAddr + j * rowBytes;
      do
      {
         k = m;
         i = 0;
         do
         {
            accumulator &= *(long *) k;
            k += 4;
         } while (++i < numWholeWords);
         if (accumulator != DirectWhite) break;
         m += rowBytes;
      } while (++j < bottomSide);
      if (j == bottomSide)          // All white pixels
      {
         enclosingRect->left = enclosingRect->right =
            enclosingRect->top = enclosingRect->bottom = 0;
         return;
      }
      topSide = j;

/* Find last row.  */

      j = bottomSide - 1;
      accumulator = DirectWhite;
      m = baseAddr + j * rowBytes;
      do
      {
         k = m;
         i = 0;
         do
         {
            accumulator &= *(long *) k;
            k += 4;
         } while (++i < numWholeWords);
         if (accumulator != DirectWhite) break;
         m -= rowBytes;
      } while (--j >= topSide);
      bottomSide = j + 1;

/* Find leftmost column.  */

      accumulator = DirectWhite;
      m = baseAddr + topSide * rowBytes;
      l = 0;
      i = 0;
      do
      {
            k = m + l;
            j = topSide;
            do
            {
               accumulator &= *(long *) k;
               k += rowBytes;
            } while (++j < bottomSide);
            if (accumulator != DirectWhite) break;
            l += 4;
         } while (++i < numWholeWords);
         leftSide += l >> 2;

/* Find rightmost column. */

         baseAddr = (long) map->baseAddr +
            (rightSide << 2) - 4;
         accumulator = DirectWhite;
         m = baseAddr + topSide * rowBytes;
         l = 0;
         i = 0;
         do
         {
            k = m - l;
            j = topSide;
            do
            {
               accumulator &= *(long *) k;
               k += rowBytes;
            } while (++j < bottomSide);
            if (accumulator != DirectWhite) break;
            l += 4;
         } while (++i < numWholeWords);
         rightSide -= l >> 2;
      }

/* Return enclosing rectangle in the pixel map's local coordinates. */

   enclosingRect->left = leftSide + map->bounds.left;
   enclosingRect->right = rightSide + map->bounds.left;
   enclosingRect->top = topSide + map->bounds.top;
   enclosingRect->bottom = bottomSide + map->bounds.top;
}
```

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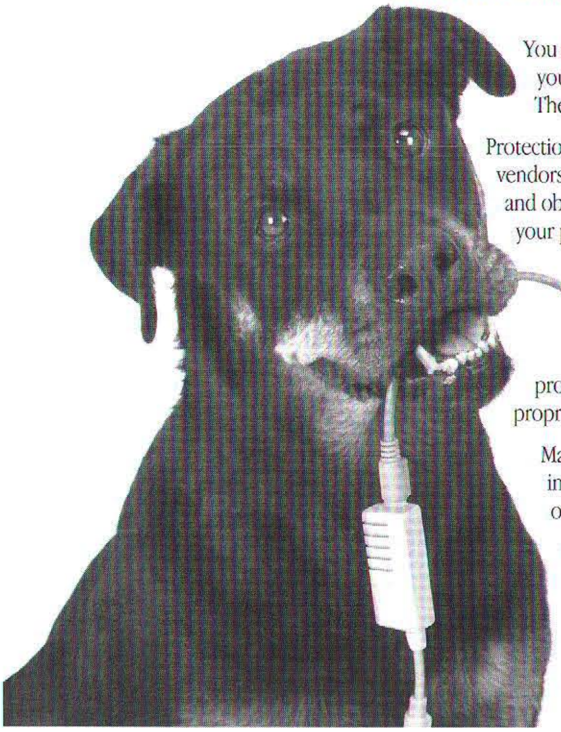

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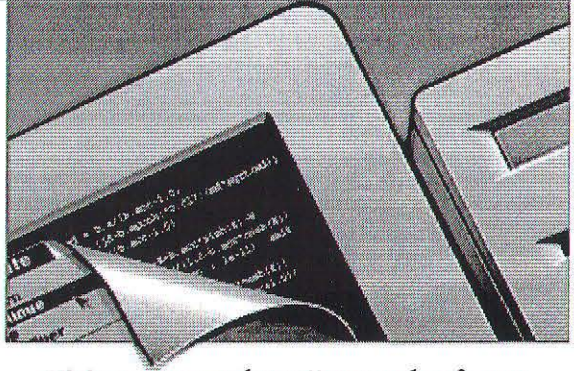

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By Jim Straus, URLs@mactech.com

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Jon Pugh	http://iw.cts.com/~jonpugh/software/Hypercard/URLs.sit.hqx
TopSoft (Internet User's Group)	http://www.topsoft.org/

Other Programmer Resources

Club Macintosh de Québec	http://www2.zone.ca/~cmq/
Everything Macintosh	http://www.cs.brandeis.edu/~xray/mac.html
Robert Lentz	http://www.astro.nwu.edu/lentz/mac/
Programmer's Challenge	http://www.mactech.com/mail-list.html#prog-challenge

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Play it again Mac	http://www.pht.com/macpages/name_me.html

HILIGHTS

Internet

Architext is a small company (started by six Stanford students) who have some interesting text indexing software. Their software tries to index based on concepts as well as keywords. To demonstrate their wares, they've taken to indexing the World Wide Web and making their database available. Check them out and try searching for some concepts.

Excite Netsearch http://www.excite.com/

Jon Pugh has created a new bookmarking HyperCard stack. This free program can help you keep track of your URLs, especially if you end up with lots of them, as I do.

Jon Pugh http://iw.cts.com/~jonpugh/software/Hypercard/URLs.sit.hqx

Macintosh

For those of you who would like to read your Macintosh news in something besides English, I suggest the Club Macintosh de Québec. This site is a French-Canadian Macintosh users group, and they have nicely organized a lot of Macintosh information. A good source for those whose French is better than their English.

Club Macintosh de Québec http://www2.zone.ca/~cmq/

Here's another huge index of Macintosh resources. Nathan Raymond has put together quite an extensive list of information.

Everything Macintosh http://www.cs.brandeis.edu/~xray/mac.html

We've all known that Robert Lentz has a great site for Mac developers, but recently I've been looking through some of his other pages. He's done an equally outstanding job with lots of information of interest to anybody with any interest in the Mac. It's time to check him out again.

Robert Lentz http://www.astro.nwu.edu/lentz/mac/

I've come across a couple of sites about gaming on the Macintosh. While we await the Pippin machine from Bandai Co. Ltd., you can see what's new in gaming on the Mac. There's lots of information on both shareware/freeware and commercial games.

Entertaining Macintosh
http://www.fen.bris.ac.uk/students/am4001/macgames/
see also http://www.princeton.edu/~pjcreath/macgames/
Play it again Mac http://www.pht.com/macpages/name_me.html

Guy Kawasaki has another mailing list he's running. This one is more evangelism than Semper Fi, but if you're trying to sell to the Macintosh community, it would be a good resource to track.

MacWay mailing list mailto: listproc@abs.apple.com
in the body of the message put: subscribe MACWAY your name

Finally, if you're interesting in the monthly Programmer's Challenge, you can join our mailing list of discussion relating to the challenge. Our mailing list web page as a form to allow you to subscribe.

Programmer's Challenge
http://www.mactech.com/mail-list.html#prog-challenge

Neat non-Macintosh site of the Month

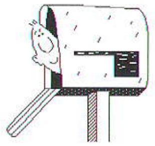
If you didn't know, people have been putting cameras around and posting the pictures on the Internet. Normally a camera is set up to take a new image periodically (every 5 minutes, for example) and the picture posted. Cameras have been set up overlooking a golf course in Hawaii, in an elementary school classroom, looking at a fish tank, and any number of people offices. For a fairly complete list, check out this page.

Cameras, Cameras, and More Cameras
http://www.intertain.net/~cameras/

Well, that's it for this month. As always, if you find something interesting, or have updates, send them to **URLs@MacTech.com**

Thanks this month to Christopher Allen, Bill Goodman, Robert Lentz, Jon Pugh, Nathan Raymond, and many others for their contributions for their suggestions and pointers to new and old sites.

DIALOG BOX



By Matt Neuburg, Managing Editor

Bring Back the Good Old Days

I am an entirely self-taught, by now intermediate level Mac programmer (unabashedly Pascal – CW, though I still utilize Think Pascal 4.0.2) who enjoys *MacTech* very much. I have been reviewing and learning a great deal from your back issues from the "distant" past! Nevertheless, I do have certain beefs. I am somewhat disturbed by the trend to feature to such a great extent the more technically advanced aspects of programming understood by the few, from which the rest of us can learn very little, I'm afraid. In the past there was a certain gleeful joy about programming, a certain spirit and amazement and perhaps naiveté about it all that seems to be missing now. The magazine seems too severely oriented to the well-equipped professional, with an insufficient amount of time devoted to us weekend, sparetime adventurers.

Additionally, far too much space is given over to Symantec and not enough to Metrowerks. And there is just too %^&* much C++. As a "Pascallian", I read a lot of C and adapt it to my needs. C++ is impossible, and I find it very hard even to follow the basic ideas being presented. I know that you cannot force people to write articles in any one language (and I know that C++ and C for that matter aren't going to disappear), but it would be great if you encouraged authors whose articles are in C/C++ to make some effort to put the Pascal/OP counterpart in a parenthetical or a footnote. At least some effort ought to be made to explain the less obvious portions of the C/C++ program code by pointing out various things that Pascal programmers should be aware of and by offering possible Pascal/OP solutions where that is possible. After all, as was noted in the November issue somewhere, *MacTech* is the only programming magazine for the Mac! Efforts should be made to include more of us in the challenge that is Mac programming. I, for one, don't like feeling left out for no good reason. Thanks.

– Jeff Niederhoffer

[Jeff, I sympathize strongly with your plea. At MacTech, we're looking to extend our scope to include once more those "weekend, sparetime adventurers" – without, of course, losing our edge as a forum for the professional developer community. Of course, sending us the articles is up to you, the readers! – Ed. man]

[As for your comments on Symantec vs. Metrowerks, please take note (in this issue) of the introduction of "From the Factory Floor" – our new column to give Metrowerks a presence in the magazine. You should expect to see this as a regular feature and you should take pride in knowing that you, the readers, made it happen. – Ed. nst]

Apple Missing its Chance to Rewrite the OS

Scott Boyd hit the nail on the head with his comments, in the November issue of *MacTech*, about overcoming limitations. Apple has made a tragic mistake in the way it is handling compatibility with Copland. The legacy code of Apple continues to grow, with all its limitations. It is very sad that developers are constantly faced with constraints that could have been built out of the system years ago.

Apple needs to look at the OS and see that when a machine has 8–16 meg as standard, 32K worth of text (or less if it's a big font) is ridiculously small. Apple has also recommended that we avoid creating too many resources (I can't recall the exact figure, but I believe it is in the 2K range). In Apple's words, "The Resource Manager is not a Database". My question is: Why not? Why can't we have a 10,000 entry file that contains 60K of text that can be written in a few lines of code? Why do we need to do linear searches to find a resource?

How could Apple have fixed these problems? One obvious way might be to create new Managers with new APIs. I'm sure developers would flock to such managers. While this would work, I think Apple could have done something more radical to rid itself of all this legacy code.

Apple could have created Gershwin from the start, a real multi-tasking OS. For compatibility, it could create a virtual System 7 machine, much like MS Windows creates a virtual machine for DOS programs. This could have been a single thread in Gershwin that emulated a System 7 environment, with 68k emulation and all. Gershwin programs would be 100% native, running on a pre-emptive native OS. If you need to run System 7 software, you have that too. The toolbox APIs could be completely rewritten, no constraints required. Likewise, Apple could have written a new file system that fixes many of the limitations of HFS. The File System Translation Manager would support old "inferior" file systems, much in the same way as we can read and write DOS disks.

Of course, we know none of this will happen. And unfortunately, it also means that we won't see a truly pre-emptive MacOS for at least 4 to 5 years. Boy, that Mac will be great in the year 2000; I can't wait. Don't get me wrong, I love my Mac. It is just disappointing that Apple has stumbled so much for so long.

– Mark Munz, Puppy Dog Software

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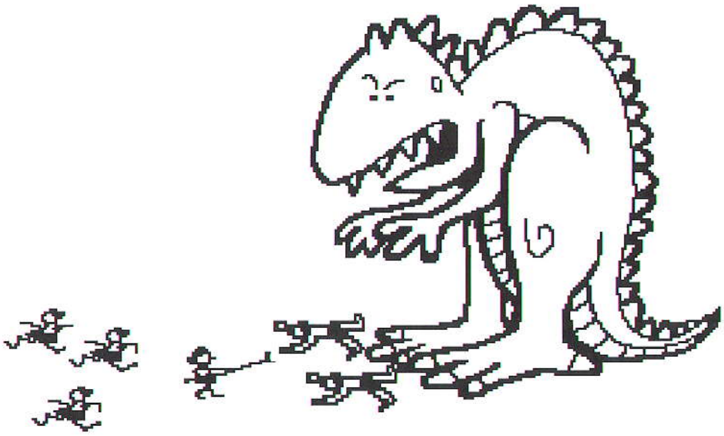

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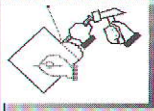

Papers at MacHack are one of the important parts of the conference. Some of the papers that have been presented in the past are:

The Technology of Emulation: 68K on PowerPC
Making Mac Listen: A Voice Recognition Toolkit for Macintosh Applications
Optimizing Source Code - Getting the most from your Mac
Avoiding Landmines and Other Cross Platform #%@!
Creating a Consistent 3D Interface
The Design of Interactive Television Applications
The Macintosh as an Internet Server

If you have a way-cool application, a new technology or new way of doing something, or a good tutorial on present technologies and how they work, we want a paper from you.

Abstracts are required by February 15, 1996. Please submit them to:
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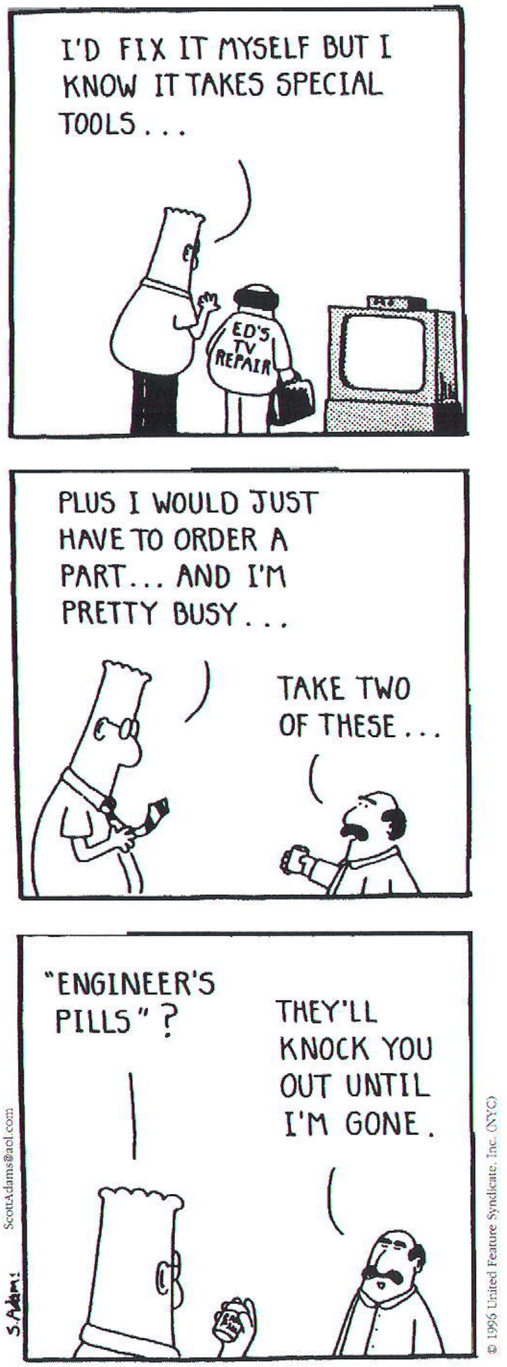
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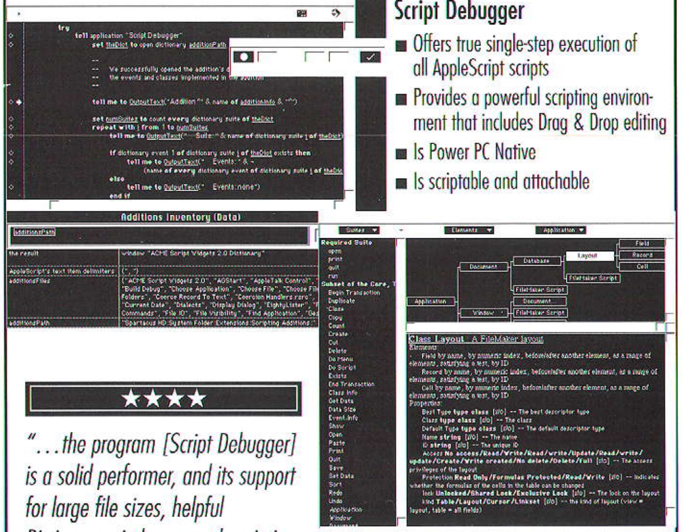

```
try
    tell application "Script Debugger"
        set theDict to open dictionary additionPath
        --
        --    We successfully opened the addition's d
        --    the events and classes implemented in the addition
        --
        tell me to OutputText("Addition "" & name of additionInfo & """)

        set numSuites to count every dictionary suite of theDict
        repeat with i from 1 to numSuites
            tell me to OutputText("    Suite: " & name of dictionary suite i of theDict)

            if dictionary event 1 of dictionary suite i of theDict exists then
                tell me to OutputText("    Events: " & ¬
                    (name of every dictionary event of dictionary suite i of theDic
            else
                tell me to OutputText("    Events:none")
            end if
```

★★★★

“*. . . the program [Script Debugger] is a solid performer, and its support for large file sizes, helpful Dictionary window, superb scripting additions and complete scriptability make it a very good choice.*”
Avi Rappoport and Ed Allen
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Becoming a Macintosh Service Provider continued from page 59

of one to two hundred per month. About 900 listings are currently searchable. Some other Internet experiments and surveys indicate that as many as 5000 Mac OS WWW servers may be publicly available on the Internet. If automated techniques being developed here for listing them work, the number of servers in the listings will grow dramatically before New Year's Day 1996.

The STAR Site

In an attempt to help focus attention on some of the best sites, a STAR site was established to feature a Mac OS site every few days, and this is the second most popular page at the site. The New Servers listings page is the most popular so far.

List your Mac WWW sites, public and internal!

If you're considering establishing a Mac OS WWW site, take some time with these listings. If you have at least one Mac OS WWW server, list it! We ask that those who have internal WWW servers, but who still wish to participate in the Mac WWW Server community, list their URL as “internal site,” so that NetScape will report “...cannot connect to server... internal site...” In this way all Mac webmasters who wish to can show what they are doing with the technology, and meet and work with others who are attempting similar efforts, whether public or private.

Tips & Tidbits continued from page 112

```
    InitGraf( &qd.thePort );
    InitFonts();
    InitWindows();
    InitMenus();
    TEInit();
    InitDialogs( 0L );
    InitCursor();
    MaxApplZone();
  } // end InitTheMac

  static Boolean GetAFile( FSSpecPtr file )
  {
    SFTypeList        types;
    StandardFileReply reply;

    StandardGetFile( NULL, -1, types, &reply );
    if ( reply.sfGood )
      BlockMove( &reply.sfFile, file, sizeof( FSSpec ) );
    return reply.sfGood;
  } // end GetAFile

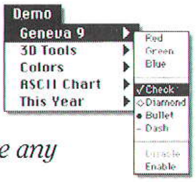
  void main( void )
  {
    FSSpec      srcFileSpec;
    OSErr       theErr = noErr;

    InitTheMac();
    if ( GetAFile( &srcFileSpec ) )
      theErr = FSpTrashFile( &srcFileSpec );
  } // end main

#endif // TEST_TRASH_FILE
```

MENU MILL

is a collection of five menu definition resources (MDEFs) that you just paste into your project's resource file.



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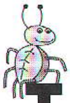

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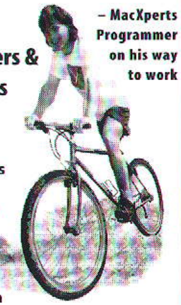

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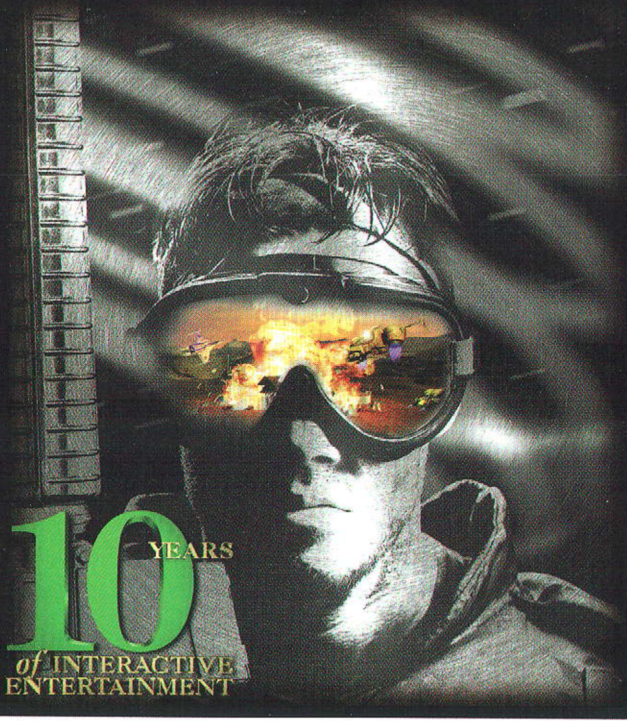

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For Macintosh Programmers & Developers
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NEWSBITS

By John Kawakami, MacTech Magazine Editorial Assistant

YET ANOTHER PLATFORM FOR CODEWARRIOR: JAVA

Metrowerks, the leading provider of Macintosh development tools, today announced that it will provide a suite of Java™ development tools, code-named Wired, for the Macintosh platform. In addition, Metrowerks announced it intends to ship the first developer release of the Java tool suite in May, 1996.

The combination of Java, CodeWarrior and the Apple Macintosh makes for a powerful Internet development solution. Sun's Java allows Internet sites to fully incorporate motion and sound, real-time information updates, and user customization and feedback. Apple's Macintosh family of personal computers is heralded as the multimedia development platform of choice, with Dataquest estimating 63% of multimedia content is developed on the Macintosh. Metrowerks' CodeWarrior product line is the market-leading development environment for Macintosh, and is widely credited as a key factor in enabling hundreds of Macintosh developers to make a quick and easy transition to the RISC-based Power Macintosh line.

Using Java, which is syntactically similar to C++, developers can write custom mini-applications called applets. When integrated into Internet web pages, applets can enable expert graphics rendering and real-time interaction with users, live information updating, and instant interaction with servers on the Internet. Applets are downloadable from any server and run safely on any platform.

Metrowerks will provide full Java support in its Macintosh hosted CodeWarrior products. The company anticipates that the first developer release of Java for the Macintosh will be ready for CodeWarrior 9, which is expected to be available at Apple's Worldwide Developer Conference in San Jose, California in May 1996.

Metrowerks:
mailto://info@metrowerks.com
http://www.metrowerks.com
Sun:
http://java.sun.com

APPLE'S NOW HAS CREATOR CODE REGISTRATION ON THE WORLD WIDE WEB

If you haven't been registering your type and creator codes with Apple because their Hypercard based registration system is out of date and inconveneint, well, you now have no more excuses. Apple has put type and creator registration forms on the web, and registration is faster and more convenient than ever. Fill out the form and submit it to Apple, and you receive a confirmation or denial of your request around 48 hours later.

Also at this website, Apple has also implemented a searchable database so potential registrants may verify that their choice is unique. Developers can search up to sixteen codes at a time to see if they have been assigned. Owner information related to the codes, such as company, contact, address, phone, etc., is confidential. Also available on their web is general information about registration and other creator code related information.

A form to register your file type and creator codes:
http://dev.info.apple.com/cftype/main.html
A form to search the database:
http://dev.info.apple.com/cftype/find.html

APPLE DELIVERS OPENDOC FOR MAC OS, ON SCHEDULE

Delivering on its promise to complete the development of OpenDoc component software technology in 1995, Apple Computer, Inc. today announced the availability of the OpenDoc for Mac OS Software Development Kit (SDK), which contains the completed OpenDoc software as well as sample code and tools for development of OpenDoc-based solutions. Demonstrating their support, 300 software developers who have been working with early versions of the SDK, made commitments to deliver OpenDoc-based components to their customers in 1996. These commitments mark the beginning of the evolution toward component-based software aimed at making computing easier for all users.

"By shipping OpenDoc, we've taken he first big step toward the next generation of personal computer software," said David Nagel, Apple's senior vice president of worldwide research and development. "As Apple and others make OpenDoc-based solutions available in 1996, computers will become more easily customized for the needs of specific users, and we'll see small innovative software developers returning to the software business. And because OpenDoc is created by an open alliance, computer customers will get more freedom of choice and won't be tied to the arbitrary decisions of a single company."

Apple plans to deliver the OpenDoc technology to its customers as part of the Mac OS, through hardware bundling and in component-based products throughout 1996. Apple also is actively incorporating OpenDoc technology into its system software.

The OpenDoc for Mac OS SDK includes OpenDoc system software for Power Macintosh and 680x0-based systems, sample code, full documentation, and a set of development tools. Apple also plans to deliver versions of OpenDoc in 16 additional languages in early 1996. Developers can download the entire SDK beginning on November 10, 1995 through the World Wide Web at http://www.opendoc.apple.com or send email to opendoc@apple.com to receive a free developer CD by mail. *[There will be a copy of the OpenDoc 1.0 CD in the February issue of MacTech – watch for it! Pub. nst]* Developers can also download additional development tools from Apple, Metrowerks and Symantec, including a pre-release version of Apple's OpenDoc Development Framework (ODF) for Mac OS.

Component Validaion Services

CI Labs, the vendor-neutral industry association for distributed component technologies, last week announced its plans to roll out component validation services in the first half of 1996. These services along with an accompanying logo program will deliver on the promise of interoperability that CI Labs has pledged to provide.

The Promise of Cross-Platform Component Software

The availability of the OpenDoc for Mac OS marks the first of four platform implementations planned to ship over the next year. In addition to Apple's plan to deliver OpenDoc for the Mac OS, IBM Corporation has announced plans to deliver OpenDoc for AIX, OS/2, Windows NT and Windows '95.

OpenDoc Support Grows

More than 300 developers have stated their support for OpenDoc for Mac OS and their intention to deliver products to the market in 1996. This list grows daily as an increasing number of ISVs see the opportunities to use component software to deliver innovative products to their customers.

Interspersed among the 300 well known and unknown companies planning to support OpenDoc are a handful of unlikely OpenDoc developers including the following: Kinko's is a US based chain of photocopy shops; Pac Bell Directory publishes yellow pages phone books; Viacom is the media giant that owns the cable network, MTV; and Virtual World Entertainment runs a chain of "virtual reality" entertainment centers where you go into a fake "cockpit", complete with switches and lights and a big computer monitor, and wage a simulated Robotech/Battlemech war on your friends. OpenDocVR?

The complete list of committed companies is at:

http://www.opendoc.apple.com/committed.html

The very attractive OpenDoc homepage, where you may download OpenDoc and the ODF, is at:

http://www.opendoc.apple.com

ICONIX Debuts Object Oriented Methodology Training on CD-ROM

Longtime object oriented programming tools developer and training consultants, ICONIX, noted that programmers were requiring more education and training about OO methodologies. As president, Doug Rosenberg, commented, "ICONIX has been fighting CASE tool feature wars for the last eleven years. A few years ago we realized that adding more features to our CASE tools wasn't increasing the success rate of our clients on their projects, and that we needed to deliver methodology training directly to the desktop.

"Our first CD-ROM training course 'An Object Methodoloy Overview' provides a good start in that it helps to understand the big picture of OO methods in an incredibly short time, but our customers have been very clear in expressing their need for 'on-line methodology help' with the same level of detailed instruction we provide in our on-site training."

Anticipating the trend that has brought Booch, Rumbaugh, and Jacobson together in an effort to unify their methods, the CD-ROM titled "A Unified Object Modeling Approach" offers extensive tutorials on the strengths of each method: Jacobson for user-driven requirements and traceability across the lifecycle, Rumbaugh for domain analysis and reuse across multiple projects, and Booch for detailed C++ design. In addition, prototyping is stressed as a requirements definition technique, with extensive explanations on how to derive Use Case and Domain Object Models from prototypes.

ICONIX Software Engineering, Inc (ph. (310) 458-0092):
http://www.biap.com/iconix/

MacHack Winner, CyberFinder, Goes Commercial

Aladdin Systems began shipping CyberFinder 2.0, a utility which gives Macintosh users an easier way to navigate the Internet. Based on a entry to the hack contest at MacHack, CyberFinder is a control panel which allows users to create new types of Finder icons, called "bookmarks," that point to sites on the Internet. Double click on a bookmark, and the proper application launches and resolves the URL.

CyberFinder 2.0 sports a nifty notable feature, "HotKeys", which will allow users to go to Internet sites from within any application they happen to be using. The user simply selects the URL, presses the HotKey, and voilà, instant gratification. Now you don't have to wait for your favorite email client to add Internet Config support! There's also another handy HotKey which will "grab" a selected URL and produce a bookmark in a designated folder.

If you need CyberFinder, you already know it. The price is US$30. There's the original version at the MacHack site below, and a fifteen day demo at the following:

http://www.aladdinsys.com
ftp://ftp.aladdinsys.com

The original MacHack entry was also called CyberFinder and is available at:

ftp://ftp.machack.com/Hacks95/CyberFinder.sit.bin

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Learn C on The Macintosh Second Edition By Dave Mark: Learn C on The Macintosh Second Edition: This is a completely revised edition of Learn C on The Macintosh. With this self-teaching, easy-to-understand book and the enclosed CD-Rom, you get everything you need to start programming in this widely used language. New to this edition are updated and enhanced exercises that lead you step by step through the programming fundamentals and C language basics including function, variables, pointers datatypes, data structures, and the file input and output. Also new is completely rewritten code, plus answers and source code for all of the exercises. The new CD-ROM with Metrowerks Code Warrior™ Lite, a special version of one of the hottest Macintosh programming environments, (including a PowerPC version). ~~$34.00~~ **$31.45**

Tricks of The Mac Game Programming Gurus is the ultimate resource for beginning to expert game programmers who already have general programming experience. Complete overview of all the necessary components of game programming on the Macintosh. Hundreds of tips, tricks, and insider secrets from Mac game programming experts on a CD-ROM, packed with valuable tools, utilities, sample code, Code Warrior™ Lite and game demos. Coverage of cutting-edge topics such as QuickDraw 3D and Power Mac optimization and inside info on how Glypha III was created. Unique in the marketplace – no other Mac game programming book is this complete! The book contains instruction, tips, and source code from the top names in Mac game development today. The secrets, examples, and code can't be found anywhere else! These are the tried-and-true tricks that work behind the scenes in the most popular commercial and shareware Mac games. Throughout the book, you'll find special interviews with some of the most well-known Mac game programmers. They reveal their secret solutions created while they developed their popular games. ~~$50.00~~ **$45.00**

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Roaster DR1™– Be the first Macintosh developer on your block to take advantage of the unique capabilities of Sun's™ new Java™ Programming Language! Developer Release 1 of Roaster™, new from Natural Intelligence, Inc., is the first ever development environment for writing, testing, and running Java™ applets on the Macintosh. Features include: fully integrated development environment – project window that includes a Finder-like view of packages – lightning-fast – Macintosh native compiler – source code editor with powerful search features and intuitive use interface – runtime engine for quick and easy applet testing. When you purchase Roaster™, you are entitled to: unlimited, personalized tech support throughout the length of your subscription DR 1, DR 2, Roaster 1.0, and one additional update. Roaster™ is accelerated for Power Macintosh. Requirements Macintosh or Macintosh compatible computer with a Motorola 68020 or higher or Power PC processor; CFM-68K (for 68K machines); 8MB RAM; Color QuickDraw; System 7.1.2 or later; (System 7.5 or later for 68K machines); CD-ROM drive to install the software. Price: $399 Special Price: $299

Symantec C++ is the industry-standard Macintosh development system--and now it's native for Power Mac. You can develop full-featured Power Macintosh applications quickly and easily using revolutionary new features that save time and enhance your productivity throughout the development cycle. Environment includes: A true native Power Mac implementation of the C++ language, including support for templates and multiple inheritance; MrC/MrC++ compilers for fast Power Mac executable code (22% faster than with the standard Symantec or Metrowerks compilers); Visual Architect for fast, easy GUI generation; A new THINK project management system that supports large, complex applications, nested projects, and hierarchical project organization; A new editor/browser that displays classes and automates many editing functions; A powerful, easy-to-use source code debugger; The industry-standard THINK Class Library; Free subscription—receive the next two updates

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MacTech CD-ROM, Volumes 1-10: Includes over 1230 articles from all 115 issues (1984-1994) of MacTech Magazine (formerly MacTutor). All article text and source code. Now in THINK Reference format. The CD includes Symantec's THINK™ Reference 2.0, working applications with full documentation, product demos for developers and more. See advertisement, this issue: $49. Upgrades $39.
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Symantec C++ for 68k, allows you to build applications faster and easier with the powerful combination of fully integrated visual tools and the latest in C and C++ compiler technology. C++, now the standard in development languages, provides an object-oriented approach to application development, and the resulting code is extensible, reliable, and maintainable. Includes: Integrated Environment with full source-code debugging, integrated editing and browsing, and resource creation and editing; support for standard language features such as templates and multiple inheritance as well as quick compile times and highly optimized code; Incremental Linker which eliminates long link times; THINK Class Library – a mature, C++ based, application framework provides a solid foundation on which to build factored and scriptable applications with support for C++ exceptions, run-time type identification, persistent objects, and AppleEvents; Visual Architect™ to visually design your user interface and automatically generate complete THINK Class Library source code; THINK Inspector which provides you with quick and easy navigation of your application's class hierarchy while it is running; Project Models to start new projects quickly from templates either provided in this package or created to fit your own needs; Source-Code Control with integration with Apple's SourceServer (included) provides reliable version control and supports team programming; Support for Scripting lets you automate complex, multiproject operations using AppleScript or Frontier scripting; Powerful Standard Libraries which includes IO Streams, ANSI standard C library, and sample programs. Full source code is included; Extensibility supports third-party editors, and AppleScript and MPW tools (available from Apple) and allows access to THINK Reference; Create applications; desk accessories; device drivers; and any kind of code resource, including HyperCard XCMDs and XFCNs, system extensions, and control panels; Migration Path to Power Mac – Create applications that run on 68K Macs and Power Macs (emulated). These applications can easily be migrated to native Power Mac, by trading up to Symantec C++ for Power Mac. Price: $79

Mastering the THINK Class Library by Richard Parker. Now that Symantec's long-awaited PowerPC native compiler is here, developers are taking another look at THINK. This book provides a thorough examination of Symantec's extensive Class Library and the Visual Architect, a graphic user interface development tool that allows you to produce commercial-quality applications with a minimum of effort. A complete description of the structure and operation of the TCL includes explanations of all code generated by the Visual Architect, any necessary custom code, and the operation of this code. Visual Architect tutorials provide you with a step-by-step approach for simplifying the development of complex Macintosh applications. 496 pages ~~$29.95~~ **$26.96**

A Fragment of Your Imagination by Joe Zobkiw. Here's some practical help for creating code resources and code fragments for the Macintosh and Power Macintosh. Rather than simply gathering and indexing chunks of this vital code, the author provides thorough explanations to teach you more about how the Macintosh system functions as a whole. He also provides hard to find information about techniques used to structure and build fat, safe fat, and accelerated code resources for use on both 680x0 and Power Macintosh. All code is reusable and is provided on the disc, along with Metrowerks Code Warrior Lite. Book/CD-ROM, 528 pages ~~$39.95~~ **$35.96**

Inside CodeWarrior 8: Includes CodeWarrior IDE User's Guide. This manual shows you how to use the CodeWarrior IDE (Integrated Development Environment). It shows you how to create software for 68K and PowerPC Mac OS, Win32/x86, and Magic Cap. It also shows you how to use ToolServer from the IDE and how to control the IDE using AppleScript. The next highlight is CW Error Messages, which describes the errors you might encounter while using CodeWarrior compilers and linkers. This manual contains descriptions, source code examples, and fixes to these errors, as well as the Debugger Manual, which was updated for CW7 including new inline and exceptions debugging, and a new troubleshooting section. Next up is the MPW Tools Manual, which shows you how to use Metrowerks compilers, linkers, and other tools under the MPW Shell. Updated for CW7, new chapters comparing Metrowerks and other MPW tools, and then onto C, C++, and Assembly, and Pascal Language Reference, covering the Metrowerks implementation of C, C++, and 680x0 assembly language programming, updated for CW7. The Pascal refs also include the new UNSIGNEDWORD and UNSIGNEDLONG. Also included for this time are Profiler and ZoneRanger Manuals updated for CW8. $34.95

Inside PowerPlant is the Power-Plant Manual, and contains information about creating PowerPlant applications using the CodeWarrior IDE and PowerPlant Constructor, and describes major PowerPlant classes and resources. Also included are the PowerPlant Constructor Manual, including View, TextTraits and Custom Types editing, and PowerPlant Library Reference, covering all classes and functions in PowerPlant, updated for CW8. $34.95

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QC™ by Onyx Technology, is a system extension that stress tests code during runtime for common and not-so-common errors. Tests include heap checks, purges, scrambles, handle/pointer validation, dispose/release checks, write to zero, de-reference zero as well as other tests like free memory invalidation and block bounds checking. QC is extremely user friendly for the non-technical tester yet offers an API for programmers who want precise control over testing. QC is Also available in Japanese. $99.95

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Inside Macintosh®: CD-ROM by Apple Computer, Inc. Inside Macintosh is the essential reference for programmers, designers, and engineers for creating applications for the Macintosh family of computers. Inside Macintosh CD-ROM

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See pages 18 & 19 for more information

Learn C on The Macintosh Second Edition By Dave Mark: See page 100

Tricks of The Mac Game Programming Gurus See page 100

Macintosh C Programming Primer Volume I, Second Edition, Inside the Toolbox Using THINK C by Dave Mark and Cartwright Reed. This new edition of this Macintosh programming bestseller is updated to include recent changes in Macintosh technology, including System 7, new versions of THINK C and ResEdit, and new Macintosh machines. Readers will learn how to use the resources, Macintosh Toolbox and interface to create stand-alone applications. 672 pages, ~~$26.95~~ **$24.25**

Macintosh C Programming Primer Volume II, Mastering the Toolbox Using THINK C by Dave Mark. Volume II picks up where Volume I leaves off, covering more advanced topics such as: Color QuickDraw, THINK Class Library, TextEdit, and the Memory Manager: 528 pgs. ~~$26.95~~ **$24.25**

Macintosh OLE2 Programmer's Reference: Working With Objects: Provides a complete reference to the extensible protocol of Object Linking and Embedding, version 2.01 for Macintosh System 7. Understanding of C/C++ helpful, but not necessary, and comes with a CD. Working With Objects describes the visual and interactice interfaces that support the component objects, provides details of the OLE 2.01 for the Macintosh user Interface, addresses the issues of object class registration, shows how to implement the drag and drop objects from one application to another, covers the interface that exposes the basic embedding functionality, and includes descriptions of API functions. ~~$44.95~~ **$40.45**

Macintosh Pascal Programming Primer Volume I, Inside the Toolbox Using THINK Pascal by Dave Mark and Cartwright Reed. This tutorial shows programmers new to the Macintosh how to use the Toolbox, resources, and the Macintosh interface to create stand-alone applications with Symantec's THINK Pascal. 544 pages ~~$26.95~~ **$24.25**

Learn C++ on the Macintosh by Dave Mark. After a brief refresher course in C, Learn C++ introduces the basic syntax of C++ and object programming. Then you'll learn how to write, edit, and compile your first C++ programs through a series of programming projects that build on one another as new concepts are introduced. Key C++ concepts such as derived classes, operator overloading, and iostream functions are all covered in Dave's easy-to-follow approach. Includes a special version of Symantec C++ for Macintosh. Book/disk package with 3.5" 800K Macintosh disk. 400 pages, ~~$36.95~~ **$33.26**

Programming Primer For The Macintosh® Volume 1 by John Whittle and Judy May. This book provides an introduction to Macintosh programming, using C++ as the example language, and provides realistic, easy to follow, programming examples designed to work with either Symantec® C++ or Metrowerks® CodeWarrior™. Also includes one 3.5" disk with source code for the programming examples, along with numerous, useful, public domain utilities to use with each compiler. ~~$37.95~~ **$34.15**

Mastering the THINK Class Library by Richard Parker. See page 68

Programming in Symantec C++ for the Macintosh by Judy May and John Whittle. This book will introduce you to object-oriented programming, the C++ language, and of course Symantec C++ for the Macintosh. You don't have to be a programmer, or even know anything about programming to benefit from this book. Programming in Symantec C++ for the Macintosh covers everything from the basics to advanced features of Symantec C++. If you are a Think C or Zortech C++ programmer who wants to learn more about object-oriented programming or what's different about Symantec C++, there are chapters specifically for you. Includes helpful examples of C++ code that illustrate object-oriented programs. ~~$29.95~~ **$26.95**

Symantec C++ Programming for the Macintosh, Second Edition by Neil Rhodes & Julie McKeehan is the perfect introduction to C++ programming – the most popular programming language for the Mac! This updated edition is the easiest way to learn C++ in the Think environment, using many examples and hands-on coding experience. The official Symantec book, developed in cooperation with the Product Development staff. Provides valuable solutions, information, and advice for MPW programmers who are migrating to the Think environment. Disk includes source code from the book and example applications ~~$45.00~~ **$40.50**

Teach Yourself Mac C++ Programming in 21 Days by Namir Clement Shammas is the easy-to-follow 21-day format teaches readers how to program in C++ using the Symantec C++ compiler. It also shows readers how to develop GUI applications using the latest version of the THINK Class Library (TCL). Targets Symantec C++ 7.0, one of the hottest programming languages and development environments. Discusses the basics of programming for the Mac using TCL and the Visual Architect utility. Uses notes, tips, and warnings, as well as Q&A, Quiz, Exercise, and Do/Don't sections to teach users the C++ programming language. ~~$29.99~~ **$26.99**

Writing Localizable Software for the Macintosh by Daniel R. Carter. 469 pages. ~~$26.95~~ **$24.25**

Global Interface Design, A Guide to Designing International User Interfaces by Tony Fernandes, AP Professional. Global Interface Design addresses the issues involved in product development for a global market with a "real world" focus. While covering major areas developers should address during the development cycle, Tony Fernandes provides insight into researching cultural differences. This book examines the differences found all over the world, such as cultural symbolism and taboos, and how they impact user interfaces. ~~$34.95~~ **$32.35**

Taligent's Guide to Designing Programs: Well-Mannered Object-Oriented Design in C++ ~~$19.50~~ **$17.55** Call for more information.

Software By Design: Creating User Friendly Software by Penny Bauersfeld (Series Editor: Tony Meadow). This excellent reference provides readers with a thorough how-to for designing software that is easy to learn, comfortable to operate and that inspires user confidence. Written from the perspective of Macintosh, but compatible with all platforms. Stresses user input from initial design, through prototyping, testing and revision. Provides tools for analyzing user needs and test responses. Includes exercises for sharpening user-oriented design skills. ~~$29.95~~ **$26.95**

Macintosh Programming Techniques by Dan Sydow (Series Editor: Tony Meadow). This tutorial and handbook provides a thorough foundation in the special techniques of Macintosh programming for experienced Macintosh programmers as well as those making the transition from DOS, Windows, VAX or UNIX. Emphasizes programming techniques over syntax for better code, regardless of language. Guides the reader through Macintosh memory management, 10% OFF ALL BOOKS!

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Macworld Ultimate Mac Programming by Dave Mark. HOT ITEM! Reveals the secrets of Mac programming and presents important, timesaving techniques. ~~$39.95~~ **$35.95**

Mac Screamer, The Ultimate Macintosh® Supercharging Kit by Jan Harrington covers 30 Macintosh models, including the Classics, LCs, PowerBooks, and Quadras and gives software solutions and hardware tips to accelerate Mac performance. It lets readers in on do-it-yourself tips that can save them over 25% on upgrade costs. ~~$35.00~~ **$31.50**

Programming for System 7 by Gary Little and Tim Swihart, is a hands-on guide to creating applications for System 7. It describes the new features and functions of the operating system in detail. Topics covered include file operations, cooperative multitasking, Balloon Help, Apple events, and the File Manager. Numerous working C code examples show programmers how to take advantage of each of these features and use them in developing their applications. 384 pages. ~~$26.95~~ **$24.25**

Guide to Macintosh System 7.5 by Don Crabb. Written by an industry expert, this is the first thorough book on the new and improved Macintosh operating system. Readers will learn all the highlights of the new System, including how to work efficiently with applications. Intuitive, task-oriented approach teaches topics the way users think, not the way the machine thinks. Covers all the new features of System 7.5, including PowerTalk, PC Exchange, and MacTCP. Written by a world-renowned Mac expert. ~~$25.00~~ **$22.50**

A Fragment of Your Imagination by Joe Zobkiw. See page 101

How To Write Macintosh Software by Scott Knaster is a great source for understanding Macintosh programming techniques. Drawing from his years of experience working with programmers, Scott explains the mysteries and myths of Macintosh programming with wit and humor. The third edition, fully revised and updated, covers System 7 and 32-bit developments, and explores such topics as how and where things are stored in memory; what things in memory can be moved around and when they may be moved; how to debug your applications with MacsBug; how to examine your program's code to learn precisely what's going on when it runs. 448 pgs. ~~$28.95~~ **$26.05**

Danny Goodman's Macintosh® Handbook Featuring System 7 by Danny Goodman with Richard Saul Wurman. It includes over 100 spreads break down and clarify Mac problems and includes insider's tips. ~~$29.95~~ **$26.95**

Real World Apple Guide, For The Mac NEW! is the much anticipated help and navigational aid component of the new Apple System 7.5 OS. The book is a practical introduction to Apple Guide for programmers. It explains the design and function of Apple Guide, how to design your own guides using Apple Script. Comes with a disk of sample Apple Guides for Apple Guide-compliant applications. ~~$39.95~~ **$35.95.**

Danny Goodman's Apple Guide Starter Kit HOT ITEM! by Danny Goodman and Jeremy Joan Hewes. Two highly respected experts offer a different approach for creating your own Apple Guide databases. With Danny's Guide Starter program you can make guides quickly and easily, without having to learn a scripting language, write coded files, or use several different files and programs to produce your database (which is what you'd have to do without the program). The authors provide advice and tips on how to design a good Guide, from planning and creation through testing, revising, and indexing. Book/disk, 320 pages. ~~$34.95~~ **$31.46**

HyperTalk® 2.2: The Book Second Edition by Dan Winkler, Scott Kamins, and Jeanne DeVoto is the most complete, authoritative source on HyperTalk 2.2 programming and troubleshooting. It covers each language element of HyperTalk 2.2 (including the odd quirk or bug). ~~$35.00~~ **$31.50**

The Complete HyperCard® 2.2 Handbook Fourth Edition by Danny Goodman is the biggest-selling Mac book – newly revised and updated for version 2.2. It shows how to build working applications using the latest version of HyperCard and covers text, painting tools, extension commands (XCMDs), scripting in HyperTalk, and more. ~~$35.00~~ **$31.50**

Dan Shafer Presents the Power of Prograph CPX is a hands-on, project-centered approach to learning the most HOT ITEM! revolutionary object-oriented programming language on the planet. The language Kurt Schmucker likes best. The language that programmers actually report having "fun" programming. This 550-page book takes you step by step through three interrelated projects of increasing complexity. Along the way you'll learn the underlying Prograph language, how to use the power of lists, and the important aspects of the CPX classes and object editors. Includes disk with all code in the book. ~~$49.95~~ **$44.95**

Visual Programming With Prograph CPX NEW! by Scott B. Steinman and Kevin G. Carver. This is the first book on Prograph CPX available through the book trade. It covers the only commercially supported visual programming language at a time when many programmers and managers, faced with continuing productivity problems, are searching for better programming environments. Prograph CPX is much more than such GUI-enhanced traditional languages as Visual Basic: It literally allows you to draw your program flow using icons and create a complete application without writing a line of code. This book is an introduction to the language and a guide for advanced users, for both Macintosh and Windows-based machines. Prograph is a fully pictorial, general-purpose, object-oriented language that speeds development with an integrated environment for design, coding, testing and debugging; with its OO framework for sophisticated GUI development; with its support for calls from C, C++, Pascal, and other routines; with its DAL, ORACLE, Sybase, AS/400 client/server DB support; and many other powerful features. ~~$34.00~~ **$30.60**

Graphic Gems V Edited by Alan W. Paeth is the newest volume in The Graphic Gems Series. It is intended to provide the graphics community with a set of practical tools for implementing new ideas and techniques, and to offer working solutions to real programming problems. These tools are written by a wide variety of graphics programmers from industry, academia, and research. The books in this series have become essential, time-saving tools for many programmers. It is the latest collection of graphics tips in The Graphic Gems Series written by the leading programmers in the field. It contains about 50 new gems displaying the most recent and innovative techniques in graphics programming. Also included is new gems in ellipses, splines, Bezier curves, and ray tracing. Includes a disk which contains source code from all five volumes and is available in both IBM and Macintosh versions. CONTENTS: Algebra and Arithmetic. Computational Geometry. Modeling and Transformation. Curves and Surfaces. Ray Tracing and Radiosity. Halftoning and Image Processing. Utilities. ~~$49.95~~ **$44.95**

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Danny Goodman's AppleScript Handbook HOT ITEM! Second Edition by Danny Goodman is a self-contained kit shows the reader how to customize and extend the capabilities of any Macintosh computer – no programming experience needed! This enhanced and expanded edition of The Complete AppleScript Handbook focuses on putting AppleScript to work in all sorts of practical situations. In addition, Danny shows you how to apply the same principles to other popular scripting systems, such as UserLand Frontier and QuicKeys. Shows readers how to use scripts to enhance the Macintosh environment, automate many processes, link data between applications, and much more. This book provides a wealth of all-new examples showing how to integrate AppleScript with the Finder, spreadsheets, desktop publishing programs, graphics applications, databases, telecommunications programs, utilities, and HyperCard. The accompanying 3 1/2" disk is jam-packed with over $100 worth of software, including AppleScript 1.1, valuable utilities, and powerful, ready-to-use scripts. ~~$39.00~~ **$35.00**

The Complete AppleScript® Handbook by Danny Goodman is a self-contained kit to customizing and HOT ITEM! enhancing the Macintosh environment. The disk contains AppleScript 1.1 Runtime, Chang Labs TableServer, and useful, ready-to-run scripts. It also shows the Mac user how to automate many processes – no programming experience necessary. ~~$35.00~~ **$31.50**

The Tao of AppleScript: BMUG's Guide to Macintosh Scripting, Second Edition by Derrick Schneider & Hans Hansen. This updated bestseller is a complete, natural introduction to AppleScript programming essentials. Readers learn how to customize applications, automate tedious tasks, and create programs without having to use a complex programming language. 2 disks contain AppleScript, QuickTime, StuffIt Lite, ResMover, and other helpful utilities. Progressive structure meets the needs of any

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Mac user, regardless of experience. Professional instructions are mixed with practical examples for easy learning ~~$29.95~~ **$26.95**

HOT ITEM!

Wireless For The Newton Software Development for Mobile Communications by Julie McKeehan and Neil Rhodes is a book that picks up where Programming for the Newton left off, teaching the reader how to develop Newton® software on the Macintosh. The enclosed floppy disk provides a sample application, as well as a fully functional demonstration version of Newton Toolkit™ (NTK™), Apple Computer's complete development environment for the Newton®. Gives hands-on Newton environment training with sample code created specifically for the Newton®. The authors are external faculty at Apple Developer University teaching classes on programming for the Newton®. Programming experience is assumed, although not in any particular language. Enclosed is a floppy disk which contains source code for a Newton application, as well as demonstration NTK™. ~~$34.95~~ **$31.45**

NEW!

Basic For The Newton, Programming for the Newton Using NS Basic by John Schettino & Liz O'Hara. This book shows owners of Newton devices how to become Newton programmers using BASIC. The authors use a straight-forward "programming by example" approach, which should have you writing your own Newton programs right away. It includes one 3.5" disk containing Demonstration NS BASIC and over fifty example programs from the book. It is Multi-platform in that teaches programming for the Newton using a Macintosh, a Windows-based PC, or on the Newton device itself. ~~$35.95~~ **$32.35**

Programming for the Newton Software Development with NewtonScript by Julie McKeehan and Neil Rhodes. Foreword by Walter R. Smith. Programming for the Newton: Software Development with NewtonScript is an indispensable tool for Newton programmers. Readers will learn how to develop software for the Newton on the Macintosh from people that developed the course on programming the Newton for Apple Computer. The enclosed 3.5" disk contains a sample Newton application from the books, as well as demonstration version of Newton Toolkit (NTK), Apple Computers complete development environment for the Newtons. A Publication of AP Professional May 1994, Paperback, 393 pp. ~~$29.95~~ **$26.95**

HOT ITEM!

Metrowerks CodeWarrior Programming by Dan Parks Sydow. Includes CodeWarrior Lite, and Full Coverage of PowerPlant™. The best information on Metrowerks CodeWarrior 6, giving full coverage to the Gold Edition. Even if you don't already own CodeWarrior 6, you'll still be able to work with the examples in this book, using the CodeWarrior 6 Lite CD that comes with it. ~~$39.95~~ **$35.95**

HOT ITEM!

C++ Programming With CodeWarrior Beginning OOP for the Macintosh and Power Macintosh by Jan L. Harrington from AP Professional. This book shows programming novices object-oriented programming techniques for the Macintosh, Power Macintosh, and Mac OS compatibles, using C++ as the example language and Metrowerks and CodeWarrior as the example compiler. The enclosed CD-ROM contains example code from the book and a full-function Metrowerks CodeWarrior compiler for running these examples. ~~$ 35.95~~ **$32.35**

HOT ITEM!

Optimizing PowerPC Code: Programming the PowerPC in Assembly Language – To take full advantage of the potential of the PowerPC, Developers need to master the Assembly Language techniques. This book shows how to use the Assembly Language in PowerPC Programs to produce faster more robust software. ~~$39.95~~ **$35.96**

Inside CodeWarrior 7: See page 101

Inside PowerPlant: See page 101

Power Macintosh Programming Starter Kit by Tom Thompson. This is the first tutorial/reference for programmers who want to enter the new world of the PowerPC chips. Users find all the details on the new microprocessors, the new RISC architecture, and how to write native code and emulation operations to create their own software for the Macintosh PowerPC. CD-ROM includes a unique compiler for writing code easily. The all-in-one book that gets programmers the information and tools they need. Programming examples reinforce explanations of code and programming tools ~~$39.00~~ **$35.10**

The ResEdit All Night Diner by David Ciskowski. An idea-filled menu and introduction to the joys of customizing software – and adding personality to the Mac with ResEdit! Shows readers how to customize default icons, the text of menus and dialog boxes, cursors, pointers, and more. Provides specific recipes for doing creative things with ResEdit – plus how to avoid problems. Disk features ResEdit program, plus lots of sample resources ~~$24.95~~ **$22.45**

ResEdit™ Complete, Second Edition by Peter Alley and Carolyn Strange. With ResEdit, Macintosh programmers can customize every aspect of their interface form creating screen backgrounds and icons to customizing menus and dialog boxes. 608 pages. Book/disk package. ~~$34.95~~ **$31.45**

Sad Macs, Bombs, Disasters and What to Do About Them by Ted Landau comes to the rescue with your Macintosh problems. From fractious fonts to the ominous Sad Macintosh icon, this emergency handbook covers the whole range of Macintosh problems: symptoms, causes, and what you can do to solve them. 640 Pages. ~~$24.95~~ **$22.45**

Macintosh® Crash Course by Glenn Brown shows Macintosh power users what to do when things go wrong with their system. Macintosh Crash Course shows readers how to overcome Macintosh system crashes, system lock-ups, and various, frustrating and cryptic error messages they regularly encounter. It includes a CD-ROM with shareware and freeware to help the user diagnose and repair system failures. Includes up-to date coverage through Macintosh System 7.5, Managing memory, Hardware diagnostics, File recovery, PowerBook problems, PowerPC problems, network utilities, hard drive repair utilities, SCSI problems, conflicts and solutions and File synchronization and utilities. ~~$29.95~~ **$26.95**

Multimedia Authoring: Building and Developing Documents by Scott Fisher addresses the concerns that face anyone trying to create multimedia documents. It offers specific advice on when to use different kinds of information architecture, discusses the human-factors concepts that determine how readers use and retain information, and them applies these findings to multimedia documents, covering the high-level issues concerning planners and authors of multimedia documents as well as those involved in evaluating or purchasing multimedia platforms. Includes one 3.5" high-density disk. ~~$34.95~~ **$31.45**

Multimedia Starter Kit for Macintosh by Michael D. Murie. This hands-on book offers the latest and greatest in multimedia for the Mac! Readers learn how to design their own multimedia projects step by step, then try it themselves with the demos, graphics, clips, and sample projects on the CD-ROM! CD-ROM contains QuickTime, sound and graphics clips and utilities, sample projects, and more. How to choose and use a variety of Macintosh multimedia tools and presentation environments. Includes demos of Adobe Illustrator, Premiere, Heizer Software programs, and more ~~$30.00~~ **$27.00**

QuickTime Starter Kit for Macintosh by Robert A. Lettieri & Judith Stern. This is the ultimate package for getting productive and having fun with Macintosh movie-making. Easy steps and valuable software help readers play, make, and edit QuickTime movies. CD-ROM includes QuickTime tools, movie clips, shareware, and demos of Premiere and other programs. Written by members of the respected Berkeley Macintosh User Group. Tips on the best ways to bring live-action video to Mac multimedia ~~$45.00~~ **$40.50**

3-D Starter Kit for Macintosh by Sean Wagstaff. The complete reference to 3-D graphics on the Macintosh – ideal for beginning to intermediate product designers, illustrators, graphic designers, multimedia developers, animators, and video producers, as well as architects and engineers! Covers more than 50 major Macintosh 3-D imaging software packages – the most comprehensive book available. Lots of idea-packed examples that illustrate how 3-D products work – individually and together. CD-ROM includes sample models, image galleries, backgrounds, and textures, plus 3-D software tryout versions ~~$40.00~~ **$36.00**

The Instant Internet Guide by Brent Heslop and David Angell. An Internet jump-start – how to access, use and navigate global networks. The Instant Internet Guide equips readers with the tools needed to travel the electronic world. The book highlights the most important sources of Internet news and information and explains how to access information on remote systems. It outlines how to use essential Internet utilities and programs and includes a primer on UNIX for the Internet. 224 pages ~~$14.95~~ **$13.45**

Internet Power Tools by John Ross is designed for intermediate PC users, Internet Power Tools is a complete book/disk package that allows access to the world's largest network – the Internet – with the same ease as one uses Windows. The detailed instructions allow readers to find their way around the Internet fast and covers e-mail, file transfers, remote logon, on-line directories, and more. The accompanying disk is packed with powerful utilities, including Cello, PC Eudora, and Panda – easy-to-use graphical user interfaces (GUI) that obviate the need for the obscure Unix line commands that everyone else must learn. It also provides access to even more software via Random House's Internet FTP site and shows how to connect to the Internet via a network connection or dial-in. ~~$40.00~~ **$36.00**

NEW!

Web Head; The Mac Guide to the World Wide Web by Mary Jane Mara. Published by PeachPit Press. This is a beginning to intermediate book that shows you how to get the most from the Web, using plain talk that beginners will understand, and online veterans will appreciate. Web Head also includes in-depth tours of the three leading Web browsers for the Macintosh: Netscape, MacWeb, and MacMosaic, and explains the basics behind all Web browsers – so you will be ready even when the next hot Web browser hits the

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scene. It will also tell you how to get connected to the Web, finding your way across webspace, fine-tuning your Mac for top Web performance, and how to turn your Mac into a multimedia Web browser. There is also instruction on how to build your own home page, posting pages on the Web, and avoiding common HTML mistakes. ~~$24.95~~ **$22.45**

The Underground Guide to Telecommuting NEW! by Woody Leonhard, Addison Wesley. There's no place like home. Especially when your boss, your kid, and the neighbor's dog are all barking for your attention simultaneously. Working away from a corporate office presents great (often unexpected) challenges and offers even greater rewards. Woody Leonhard takes on the toughest aspects of telecommuting and gives you the straight scoop on how to make it work for you. Whether you're a telecommuter, a telecommuter's boss, or just curious, The Underground Guide to Telecommuting will give you the tools and information you need to turn electricity and a phone line into major productivity. ~~$24.95~~ **$22.45**

The Elements of E-Mail Style by Brent Heslop and David Angell. Learn the rules of the road in the e-mail age. Concise, easy-to-use format explaining essential e-mail guidelines and rules. It covers style, tone, typography, formatting, politics and etiquette. It also outlines basic rules of composition within the special context of writing e-mail and includes samples and templates for writing specific types of e-mail correspondence. 208 pages. ~~$14.95~~ **$13.45**

E-Mail Essentials by Ed Tittel & Margaret Robbins is a hands-on guide to the basics of e-mail, the ubiquitous networks communication system. The book is suitable for both the casual e-mailer and the networking professional, as it covers everything from the installation of e-mail to the maintenance and management of e-mail hubs and message servers. The books explains the fundamental concepts and technologies of electronic mail, featuring chapters on Lotus applications and CompuServe, as well as information on upgrading, automation, message-based applications, and user training. E-mail Essentials is a step-by-step, jargon-free guide that will enable the e-mail user to get the most out of the communication potentials of networking. 250 pp. ~~$24.95~~ **$22.45**

HOT ITEM! **The Computer Privacy Handbook** is a practical guide to e-mail encryption, data protection, and PGP privacy software. With millions of e-mail messages and on-line discussions exchanged daily on the Internet, electronic security has become a key concern. The Computer Privacy Handbook explains practical steps individuals can take to safeguard their electronic security. It also gives a vivid description of how the "Surveillance Age" threatens each person's personal security, a non-technical introduction into data encryption, and the U.S. Government's Clipper Chip surveillance proposal. It also provides an overview of PGP, (Pretty Good Privacy), the world standard for e-mail privacy. ~~$24.95~~ **$22.45**

PowerPC System Architecture by MindShare. NEW! This book describes the hardware architecture of PowerPC systems, providing a clear, concise explanation of the PowerPC specification, the template upon which all PowerPC processors are designed. The author provides a complete description of the specification for both the 32- and 64-bit implementations. 656 pages ~~$34.95~~ **$31.46**

PCI System Architecture, Third Edition by MindShare. NEW! Describing revision 2.1 of the Peripheral Component Interconnect (PCI) bus specification, this book explores PCI's relationship to the rest of the system. It includes an in-depth treatment of PCI to PCI bridges, the PCI BIOS, the 66MHz PCI bus, and more. 592 pages. ~~$34.95~~ **$31.46**

Cyberpunk Handbook, The Real Cyberpunk Fakebook NEW! by St. Jude, R.U.Sirius, and Bart Nagel. Published by Random House. This book tells how to tell if *you* or *someone* you know is a Cyberpunk. ~~$9.95~~ **$8.95**

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Learn C on Late Night With MacHack NEW! covers the MacHack conferences from their inception in 1986, up to 1993. Doug Houseman is the program Chairperson of MacHack, and the author of this book. The accompanying CD contains over 100 of the best hacks written at MacHack over the years, including The Grouch, NetBunny, Jurassicon Park, DropSave, QuickTime Balloon Help, the Mac Clapper, Wavy, and more... ~~$29.95~~ **$26.95**

Advanced Color Imaging On the Mac OS NEW! explains how you can augment the color support supplied with Quickdraw, and QuickdrawGX, using the Palette manager to provide the best set of colors on displays with limited color capabilities, soliciting the color choices from users with the color Picker Manager/ Using the ColorSync manager to match colors between screens and input and output devices such as scanners and printers/ learning how the color Manager assists Color QuickDraw in mapping an applications color requests to the actual colors available. ~~$36.95~~ **$33.25**

3D Graphics Programming Using QuickDraw 3D NEW! by Apple Computer, Inc. Now you can incorporate spectacular 3D graphics into your applications. This book/CD-ROM package explores QuickDraw 3D, a graphics extension to the Mac OS for Power Macintoshes. The CD contains the complete QuickDraw 3D system itself and a complete database of the QuickDraw 3D API, allowing you instant access to the hundreds of graphics calls via a fast viewing engine. Book/CD-ROM, 640 pages. ~~$39.95~~ **$35.96**

Tricks of The Mac Game Programming Gurus: See page 68

Apple Guide Complete NEW! by Apple Computer, Inc. For those who want the full power of Apple's complete toolset, this book and CD-ROM package from Apple provides everything you need to produce guide files successfully, including Guide Maker, the software you use to build and test guide files. You'll learn about the complete cycle of designing as well as advanced topics such as scripting and coding guide files. Book/CD-ROM, 544 pages. ~~$39.95~~ **$35.96**

Inside AppleTalk by Gursharan S. Sidhu, Richard F. Andrews and Alan B. Oppenheimer. Apple Computer, Inc. 650 pages. ~~$34.95~~ **$31.45**

AppleScript Finder Guide, HOT ITEM! English Dialect, by Apple Computer, Inc. The AppleScript Finder Guide is an essential reference for anyone who wants to use AppleScript on a Mac to modify existing Finder scripts or to write new ones. The Finder scripting software allows you to write, record, or run scripts that trigger the same desktop actions that you trigger using the keyboard and mouse- actions such as opening and closing folders or manipulating files. This book introduces Finder scripting and describes how to record and modify simple scripts. In particular, it provides definitions for Finder object classes and commands. Use of this book requires that AppleScript be installed, and you should be familiar with AppleScript Scripting Additions Guide, and AppleScript Language Guide. ~~$19.95~~ **$17.95**

HOT ITEM! **AppleScript Language Guide,** by Apple Computer, Inc. The AppleScript Language Guide is the definitive description of the English dialect of the AppleScript scripting language. This book is an essential reference for anyone using AppleScript to modify existing scripts or to write new ones. It also contains useful information for programmers who are working on scriptable applications or complex scripts. This book begins with an introduction to scripting and an overview of AppleScript's main features. Most of the book consists of detailed definitions of AppleScript terminology and syntax in the following categories: Value classes, commands, objects and references to objects, expressions, control statements, handlers, and script objects. In addition to definitions the book provides many sample scripts and discusses advanced topics such as writing command handlers for script applications, the scope of script variables and properties declared at different levels in a script, and inheritance and delegation among script objects. To get the most out of this book, you only need to be familiar with Macintosh computers. Although not required some previous experience with another scripting language (such as HyperTalk) is also helpful. ~~$29.95~~ **$26.95**

AppleScript Scripting Additions Guide, HOT ITEM! by Apple Computer, Inc. AppleScript Scripting Additions Guide is the definitive description of the scripting additions that accompany the English dialect of the AppleScript scripting language. Scripting additions are files that extend AppleScript's capabilities by providing the additional commands or coercions for use in scripts. This book is an essential reference for anyone using AppleScript to modify existing scripts or write new ones. It also contains information for programmers who want to write scripting additions. The Scripting Additions Guide is also a how to install any scripting additions and invoke their commands, to use the standard scripting additions commands, or to write scripting additions. ~~$18.95~~ **$17.05.**

HyperCard Stack Design Guidelines by Apple Computer, Inc. is an essential book for everyone who creates Apple HyperCard stacks, from beginners to commercial developers. It covers the basic principles of design that, when incorporated, make HyperCard stacks effective and usable. Topics include guidelines, navigation, graphic design

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and screen illustration, text in stacks, music and sound, a sample stack development scenario, collaborative development, and the Stack Design Checklist. 240 pages. ~~$21.95~~ **$19.95**

Macintosh Programmer's Toolbox Assistant CD-ROM: See page 101

Inside Macintosh®: CD-ROM: See page 102

Inside Macintosh®: Overview by Apple Computer, Inc. is the first book that people who are unfamiliar with Macintosh programming should read. It gives an overview of Macintosh programming fundamentals and a road map to the New Inside Macintosh library. Inside Macintosh: Overview also covers various programming tools and languages, compatibility guidelines and an overview of considerations for worldwide development. 176 pages. ~~$22.95~~ **$20.65**

Inside Macintosh®: Files by Apple Computer, Inc. describes the parts of the operating system that allow you to manage files. It shows how your application can handle the commands typically found in a File menu. It also provides a reference to the File and Alias Managers, the Disk Initialization and Standard File Packages. 510 pgs. ~~$29.95~~ **$26.95**

Inside Macintosh®: Operating System Utilities by Apple Computer, Inc. describes parts of the Macintosh Operating System that allow you to manage various low-level aspects of the operating system. Everyone who programs the Macintosh should read this book! It will show you in detail how to get information about the operating system, manage operating system queues, handle dates and times, control the settings of the parameter RAM, manipulate the trap dispatch table, and receive and respond to low-level system errors. ~~$26.05~~ **$23.45**

Inside Macintosh®: Processes by Apple Computer, Inc. describes the parts of the Macintosh operating system that allow you to control the execution of processes and interrupt tasks. It shows in detail how you can use the Process Manager to get information about processes loaded in memory. It is also a reference for the Vertical Retrace, Time, Notification, Deferred Task, and Shutdown Managers. 208 pages. ~~$22.95~~ **$20.65**

Inside Macintosh®: Memory by Apple Computer, Inc. describes the parts of the Macintosh operating system that allow you to manage memory. It provides detailed strategies for allocating and releasing memory, avoiding low-memory situations, reference to the Memory Manager, the Virtual Memory Manager, and memory-related utilities. 296 pages. ~~$24.95~~ **$22.45**

Inside Macintosh®: AOCE Application Interfaces by Apple Computer, Inc. shows how your application can take advantage of the system software features provided by PowerTalk system software and the PowerShare collaboration servers. Nearly every Macintosh application program can benefit from the addition of some of these features. This book shows how you can add electronic mail capabilities to your application, write a messaging application or agent, store information in and retrieve information from PowerShare and other AOCE catalogs, add catalog-browsing and find-in-catalog capabilities to your application, write templates that extend the Finder's ability to display information in PowerShare and other AOCE catalogs, add digital signatures to files or to any portion of a document, and establish an authenticated messaging connection. ~~$40.45~~ **$36.40**

Inside Macintosh®: AOCE Service Access Modules by Apple Computer, Inc. describes how to write a software module that gives users and PowerTalk-enabled applications access to a new or existing mail and messaging service or catalog service. This book shows how to write a catalog service access module (CSAM), a messaging service access module (MSAM), and AOCE templates that allow a user to set up a CSAM or MSAM and add addresses to mail and messages. ~~$26.95~~ **$24.25**

Inside Macintosh®: Devices by Apple Computer, Inc. describes how to write software that interacts with built-in and peripheral hardware devices. With this book, you'll learn how to write and install your own device drivers, desk accessories, and Chooser extensions; communicate with device drivers using the Device Manager; access expansion cards using the Slot Manager; control SCSI devices using SCSI Manager 4.3 or the original SCSI Manager; communicate directly with Apple Desktop Bus devices; interact with the Power Manager in battery-powered Macintosh computers; and communicate with serial devices using the Serial Driver. ~~$29.95~~ **$26.95**

Inside Macintosh®: Macintosh Toolbox Essentials by Apple Computer, Inc. covers the heart of the Macintosh. The toolbox enables programmers to create applications consistent with the Macintosh "look and feel". This book describes Toolbox routines and shows how to implement essential user interface elements, such as menus, windows, scroll bars, icons and dialog boxes. 880 pages. ~~$34.95~~ **$31.45**

Inside Macintosh®: More Macintosh Toolbox by Apple Computer, Inc. covers other Macintosh features such as how to support copy and paste, provide Balloon Help, play and record sound and create control panels are covered in this volume. The managers discussed include Help, List, Resource, Scrap and Sound. ~~$34.65~~ **$31.45**

Inside Macintosh®: Networking by Apple Computer, Inc. describes how to write software that uses AppleTalk networking protocols. It describes the components and organization of AppleTalk and how to select an AppleTalk protocol. It provides the complete application interfaces to all AppleTalk protocols, including ATP (AppleTalk Transaction Protocol), DDP (Datagram Delivery Protocol), and ADSP (AppleTalk Data Stream Protocol), among others. ~~$29.95~~ **$26.95**

Inside Macintosh®: Interapplication Communication by Apple Computer, Inc. shows how applications can work together. How your application can share data, request information or services, allow the user to automate tasks, communicate with remote databases. ~~$34.95~~ **$31.45**

Inside Macintosh®: PowerPC Numerics by Apple Computer, Inc. describes the floating-point numerics environment provided with the first release of PowerPC processor-based Macintosh computers. The numerics environment conforms to the IEEE standard 754 for binary floating-point arithmetic. This book provides a description of that standard and shows how RISC Numerics compiles with it. This book also shows programmers how to create floating-point values and how to perform operations on floating-point values in high-level languages such as C and in PowerPC assembly language. ~~$28.95~~ **$26.00**

Inside Macintosh®: PowerPC System Software by Apple Computer, Inc. describes the new process execution environment and system software services provided with the first version of the system software for Macintosh on PowerPC computers. It contains information you need to know to write applications and other software that can run on the PowerPC. PowerPC System Software shows in detail how to make your software compatible with the new run-time environment provided on PowerPC-based Macintosh computers. It also provides a complete technical reference for the Mixed Mode Manager, the Code Fragment Manager, and the Exception Manager. ~~$24.95~~ **$22.45**

Inside Macintosh®: Sound by Apple Computer, Inc. describes the parts of the Macintosh system software that allow you to manage sounds. It contains information that you need to know to write applications and other software that can record and play back sounds, compress and expand audio data, convert text to speech, and perform other similar operations. ~~$26.95~~ **$24.25**

Inside Macintosh®: Text by Apple Computer, Inc. describes how to perform text handling, from simple character display to multi-language processing. The Font, Script, Text Services, and Dictionary Managers are all covered, in addition to QuickDraw Text, TextEdit, and International and Keyboard Resources. ~~$39.95~~ **$35.95**

Inside Macintosh®: Imaging by Apple Computer, Inc. covers QuickDraw and Color QuickDraw. The book includes general discussions of drawing and working with color. It describes the structures that hold images and image information, and the routines that manipulate them. It also covers the Palette, Color, and Printing Managers, and the Color Picker, Color Matching, and Picture Utilities. ~~$26.95~~ **$24.25**

Inside Macintosh®: QuickDraw™ GX Graphics by Apple Computer, Inc. shows readers how to create and manipulate the fundamental geometric shapes of QuickDraw GX to generate a vast range of graphic entities. It also demonstrates how to work with bitmaps and pictures, and specialized QuickDraw GX graphic shapes. ~~$26.95~~ **$24.25**

Inside Macintosh®: QuickDraw™ GX Objects by Apple Computer, Inc. introduces QuickDraw GX and its object structure, and shows programmers how to manipulate objects in all types of programs. ~~$26.95~~ **$24.25**

Inside Macintosh®: QuickDraw™ GX Environment and Utilities – A companion to QuickDraw™ GX Objects, this book contains programming information useful to any developer writing QuickDraw GX applications. It describes QuickDraw GX memory management, error handling, debugging, and mathematical functions, as well as conversion from QuickDraw to QuickDraw GX. ~~$29.95~~ **$26.95**

Inside Macintosh®: QuickDraw™ GX Library by Apple Computer, Inc. is the powerful new graphics architecture for the Macintosh. Far more than just a revision of QuickDraw, QuickDraw GX is a unified approach to graphics and typography that gives programmers unprecedented flexibility and power in drawing and printing all kinds of shapes, images, and text.

Inside Macintosh®: QuickDraw™ GX Printing This book is essential for any developer whose QuickDraw™ GX application supports printing. It shows how to support the new printing features of QuickDraw GX, including desktop printers and expandable printing dialog boxes. QuickDraw GX Printing also shows how to use printing-related objects to add custom panels to printing dialog boxes and to create custom page formats. ~~$26.95~~ **$24.25**

Inside Macintosh®: QuickDraw™ GX Printing Extensions and Drivers – Any developer who wants to create extensions to the application

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printing capabilities of QuickDraw™ GX, or who needs to write a printing device driver that works with QuickDraw GX needs this book. QuickDraw GX Printing Extensions and Drivers describes how to create printing extensions and printer drivers, and provides a complete reference to the messages, functions, and resources that they use. ~~$29.95~~ **$26.95**

Inside Macintosh®: QuickDraw™ GX Programmer's Overview – This book provides an introduction to QuickDraw™ GX, providing an overview of the QuickDraw GX environment from a developer's perspective. It introduces the QuickDraw™ GX programming and runtime environments, the relationship between QuickDraw GX and the rest of the Macintosh® systems software and the relationship between QuickDraw GX and Macintosh applications. The key elements of QuickDraw GX programming, data structures, object types, and functions used most frequently by QuickDraw GX developers are also covered. After a general introduction, this book provides readers with a series of practical examples demonstrating how to approach programming with QuickDraw GX. ~~$24.95~~ **$22.45**

Inside Macintosh®: QuickDraw™ GX Typography – This book is essential for any developer who uses QuickDraw™ GX to manipulate text. It shows how to use QuickDraw GX objects to handle all kinds of text – from plain, unstyled text to complex, mixed-direction and multi-language text with sophisticated stylistic and typographic variations. QuickDraw GX Typography shows how to create and manipulate the three different types of text shapes supported by QuickDraw GX including text shapes, glyph shapes, and layout shapes. ~~$29.95~~ **$26.95**

Inside Macintosh®: QuickTime by Apple Computer, Inc. is for anyone who wants to create applications that use QuickTime, the system software that allows the integration of video, animation, and sounds into applications. This book describes all of the QuickTime Toolbox utilities. In addition, it provides the information you need to compress and decompress images and image sequences. ~~$29.95~~ **$26.95**

Inside Macintosh®: QuickTime Components by Apple Computer, Inc.covers how to use and develop QuickTime components such as image compressors, movie controllers, sequence grabbers, and video digitizers. ~~$34.95~~ **$31.45**

Inside Macintosh®: X-Ref by Apple Computer, Inc. is a fast access to all the information in Inside Macintosh. Inside Macintosh X Ref; Provides programmers with a quick and easy way to find the exact information they need in this definitive suite of books, (all 26 volumes). It is indexed by topic, volume, chapter, and accompanying page number. ~~$19.95~~ **$17.95.**

Inside the Macintosh Communications ToolBox by Apple Computer. This book is the definitive reference to the Macintosh Communications Toolbox, an integral part of the System 7 Macintosh Toolbox that enables developers to create communications applications or add communications features to other applications.This book describes all of the routines that provide programmers with standard access to important communications services and in addition enables programmers to extend the reach of the Macintosh into non-Apple environments. ~~$24.95~~ **$22.45.**

EDITORS/DEVELOPMENT ENVIRONMENTS & LANGUAGES

BBEdit 3.1: See page 101

CMaster 2.0 by Jersey Scientific installs into THINK C 5 / 6 / 7 and Symantec C++ for Macintosh, and enhances the editor. Use its function popup to select a function and CMaster takes you right to it. Other features include multiple clipboards and markers, a Function Prototyper, and a GoBack Menu which can take you back to previous editing contexts. Almost all features bindable to the keyboard, along over a hundred keyboard-only features like "Add New Automatic Variable." Glossaries, AppleScript and ToolServer support, Macros, and External Tools you create too! $129.95

QUED/M 2.7 by Nisus Software, is a programmer's text editor which has defined the industry standard for speed and efficiency. With integrated support for Symantec C/C++, Metrowerks CodeWarrior 6, and MPW, QUED/M offers unrivaled usefulness for the Macintosh developer. In addition to supporting all the major development environments on the Macintosh, QUED/M offers dozens of powerful editing features, including unlimited undo and redo, UNIX style GREP searching, macro language, scripting, text folding, text sorting, file comparison and merging, Toolbox lookup, ten editable/appendable clipboards, line numbering, markers, displaying text as ASCII codes, vertical and horizontal screen splitting, plus much more. $149

CodeManager™ Microsoft® Visual SourceSafe™ 4.0 compatible source code control system for the Macintosh® $399. Call for more info.

CodeWarrior™ 8 CD by Metrowerks comes in two versions – Bronze and Gold. These CDs contain the CodeWarrior 7 development environment including C++, C and Pascal compilers; high-speed linkers; native-mode interactive debuggers; and a powerful new application framework called PowerPlant for rapid Macintosh development in C++. Bronze generates 680x0 code. Gold generates both 680x0 and PowerPC code. Comes in two versions – Bronze and Gold. New to these versions is an Integrated Class Browser. Faster code, Better Code Generation for PowerPC. Updated OpenDoc™ support. New Networking Classes in PowerPlant. New Editor Functions. Zero Overhead Exceptions for C++. Libraries for the new Be Operating System. CodeWarrior 8 Gold. With CodeWarrior's plug in architecture, choose your target platform from within one Integrated Development Environment. Gold supports the following platforms: PowerPC™: Mac™OS, PowerTV™, Be™OS for BeBox™. 68K: Mac™OS, Magic Cap™. x86: Windows 95™, Windows NT™. It includes C/C++ and Object Pascal. CodeWarrior 8 Bronze. Macintosh programming solution that generates code that runs native on 68K and runs emulated on PowerPC. Supports C/C++ and Object Pascal. Gold $399. Includes a 1 year MacTech subsciption. Bronze $149. Includes a 6-month subsciption.

SYMANTEC.™

Symantec C++ See page 101

THINK Pascal v. 4.0 by Symantec Corporation. Professionals and students will welcome this version of THINK Pascal. It is fully integrated for rapid turnaround time and lets you take advantage of System 7 capabilities. Features include support for large projects, enhanced THINK Class Library, System 7 compatibility, superior code generation, and smart linking. Product Contents: Four Macintosh disks, a 562-page user manual, and a 498-page object-oriented programming manual. $169

LS Object Pascal CD includes the world's first Object Pascal compiler for Power Macintosh. 100% compatible with Apple's MPW Pascal, LS Object Pascal combines the best of Apple's native development tools with innovative new technology developed at Language Systems. Compiler options specify 68K or native PowerPC code generation. Included on the CD are: LS Object Pascal compiler, Universal Pascal Toolbox interfaces, fully loaded MPW 3.3.1, 68K and PowerPC source debuggers, PowerPC assembler, online documentation, Macintosh Tech Notes, and a special version of AppMaker by Bowers Development that generates native Pascal source code. The beta release includes upgrades to v1.0 when it becomes available. $399

LPA MacProlog comprises a Edinburgh syntax Prolog compiler system set in an attractive multi-window development environment with an integrated program editor, graphical call-graph facilities and an interactive source-level debugger. LPA MacProlog features high-level access to the Macintosh ToolBox for using graphics, dialogs, windows, icons, resources in a simple and versatile way LPA MacProlog also includes interfaces to C and Pascal code resources. The MacProlog Run-time Generator enables the production of double-clickable distributable applica-tions. The compact run-time system supports first argument indexing, tail-recursion and last-call optimization. Optional add-ons tools include flex, Prolog++, MacDBI for Oracle and the MacProlog Dialog Editor. Programmer Edition $745; Developer Edition (which includes the run-time generator and distribution license) $1500

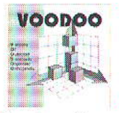
SmalltalkAgents® (STA) is a sophisticated application development environment featuring a new generation of the Smalltalk language, QKS Smalltalk™. Productivity is no longer measured in lines of code, but in project completion time. STA allows "live" direct manipulation of your objects. The development process is dynamic, interactive and iterative. Just like C/C++ and Assembly, STA provides easy and full access to the features of the MacOS™ and Mac Toolbox. You can link your non-Smalltalk code resources using our External Code Linking Toolkit™ (ECLT). You can also call back into STA from foreign functions written in C/C++, Pascal, FORTRAN, and Assembly. STA's automatic garbage collection and object-based typing will free you from tedious memory management and bookkeeping chores. A sophisticated database for source code management provides an almost infinite variety of ways to cross-reference, access, view, and manipulate your code and objects. STA includes an Application Delivery Toolkit™ (ADT) that allows you to create royalty-free, stand-alone, double-clickable applications in just a matter of minutes. The foundation of the QKS Product Family, the Agents Object System (AO/S), is an underlying task framework, housing components and services that save you years of work. Any component built in AO/S will function as an OpenDoc component or container and components from non-AO/S sources can be seamlessly integrated into the AO/S system. SmalltalkAgents List Price: $695.

SOFTWARE ENGINEERING/PROFILERS/DEBUGGERS INSTALLER TOOLS/LIBRARIES/FRAMEWORKS/DATABASES

SOFTWARE ENGINEERING

ICONIX PowerTools by ICONIX has been a leading supplier of CASE tools, since 1984. One of the first Object-Oriented CASE tool developers, ICONIX is known throughout the industry for producing affordable, high-quality tools and state-of-the-art training. Our line of Object-Oriented Analysis and Design tools, ICONIX PowerTools, is an integrated set of 10 CASE tools supporting the major phases of the system development life cycle and automating analysis, design, coding, and the management of complex systems. ICONIX is unique because we are the first to bundle CASE tools, CD-ROM training, and on-site training and consulting. Each individual module is $1,495. PowerPack Bundles: Choose any 6, 8 or 10 distinct modules of your choice to customize your own ICONIX PowerTools toolset. Our professional sales staff will gladly assist you in choosing the right tools for your project's needs. PowerPack/6: $5,995 PowerPack/8: $6,995 PowerPack/10: $7,995. (Full Product Line) Call for pricing on Upgrade Service & Training and Consulting.

NEW!



Voodoo is a version control tool for the simple and clear management of projects in which files are created in numerous versions (variants and revisions). Voodoo allows both variant and revision control, and it manages not only variants and revisions of single files, but of a whole software project (multi files, multi users, multi variants, access rights, ...). The tool offers a neat graphical user interface and is not only suitable for mere source code control but can handle all different kinds of files with amazing compression rates: typical size of delta between arbitrary files 5% (in words: five per cent) !!!! no matter whether the files are plain text or any other documents – e.g., MSWord, 4D, Canvas, FileMaker ... Please note special prices for multiple copies: single license $190; 2 pack $300; 5 pack $665; 10 pack $1140; 20 pack $2000. Add'l pricing available on request.

HOT ITEM!

PROFILERS/ DEBUGGERS

LJ Profiler by Lars Jordebo Datakonsult supports profiling of C++ 68K and PowerPC applications compiled with CodeWarrior 6, CFront or Symantec C++. Based on active profiling, i.e. profiling code called at function enter and exit, the browser application lets you follow call chain timings in hierarchical views or separate windows. Collect, organize, compare and save profiling data from different versions of your application into a project. Scriptable and recordable with full access to most internal data structures. Optional remote profiling and tracking of segment and stack usage. Full source code to what you link into your application. $295.

Last Resort Programmer's Edition records every keystroke, command key and mouse event (in local coordinates) to a file on your hard disk. This is especially useful for program testing & debugging, and for technical support and help desks. If something goes wrong (because of a power failure, system crash, forgetting to save or deleting lines) and you lose a word, phrase, or document you can look in the Last Resort keystroke file and recover what you typed. Last Resort is also useful for technical support personnel, when they have to ask "What was the last thing you did before...?" $74.95

QC™ by Onyx Technology. See page 69

The Memory Mine™ by Adianta is a stand alone debugging tool for Macintosh and native PowerPC. Programmers can monitor heaps, identify problems such as memory leaks, and stress test applications. Active status of memory in a heap is sampled on the fly: allocation in non-relocatable (Ptr), relocatable (Handle) and free space is shown, as are heap corruption, fragmentation, and more... Allocate, Purge, Compact, and Zap memory let users stress test all or part of a program. Source code is not needed to view heaps. It works on Macintoshes with 68020 or later and System 7.0 or later. $99

Spyer by InCider is a simple operated tool that records all actions (including mouse movement) you perform on a Macintosh computer and then replays them at your preferred speed. The recorded data can be saved in files for future use. Spyer works as a background process with any Macintosh application and is triggered by user defined Hot Keys. Spyer enables the "Continuous Redo" utility and is especially useful for software testing and demonstration. $39

INSTALLER TOOLS

InstallerPack™ by StepUp Software is a package of several Installer "atoms" that let developers incorporate graphics, sounds, file compression and custom folder icons into installation scripts. Compression formats supported are Compact Pro & Diamond. Each atom also available separately. Compression requires additional licensing. $219

ScriptGen Pro™ by StepUp Software is an Installer script generator which requires no programming or knowledge of Rez. Supports StepUp's InstallerPack, StuffIt compression, custom packages, splash screens, network installs, Rez code output, importing resources, and AppleEvent link w/MPW: $169

LIBRARIES/ FRAMEWORKS/ DATABASES

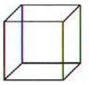
OOFILE See page 100

PowerTap™ See page 100

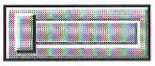
3D Game Machine v1.2 by Virtually Unlimited is a C library for creating lightning-fast 3D arcade games and interactive multimedia applications. 3DGM has a simple easy-to-use interface and features very fast rendering (15 frames per second on a 14" monitor completely texture-mapped, with a PowerMac 6100/60), full "virtual" 3D worlds with six degrees of freedom, free-form texture mapping, shading, material and light properties, convex/cave polygons with unlimited vertices, unlimited light sources, dynamic hidden surface removal, special graphic modes for fast full-screen animation, collision detection, explosion simulation, 3D data importing. Runs on all Macs! Works with CodeWarrior. $299 + license.

Animation Class Library version 2.0 (ACL2.0) is an advanced object-oriented multimedia framework, allowing fast development of high-quality interactive applications. Main features of ACL2.0 are: Powerful animation engine which supports structured sprites, collision detection at pixel precision, sprites sorting, powerful blitter and vector objects. Scrolling of background picture in circular buffer and tile-mapscrolling. Application framework for building standard and 3D controls, panes,menus, full screen displays, windows, etc. Quicktime and multi-channel sound support. >800 functions and >100'000 lines. Complete C++ source code for CodeWarrior and Symantec C++, examples, documentation and technical support. $250

dtF is a true relational database system for Apple Macintosh computers. dtF provides a powerful choice for developers who want to create database centered applications with no performance trade-offs. dtF features SQL, full transaction control, error recovery, single user, client server architecture and multi-platform support including DOS, Windows, OS/2 and UNIX. The C/C++ API is identical and fully portable cross all supported platforms. Third-party vendors supporting dtF will be able to offer a variety of advanced features and benefits to their customers royalty free. Tools are included for importing, exporting, creating and managing databases and users. Supported development environments include: Symantec, MPW, Metrowerks and more. Mac/SDK $695



MacWireFrame by Amplified Intelligence. Create your own virtual reality application with MacWireFrame, a virtual reality application frame work. Includes a complete library of object oriented graphics routines, its own easy to understand application frame work (similar to MacApp or TCL but a lot easier to understand), plus an example application program that lets you start solid modeling right away. Comes complete with fully documented source code. All new purchases will be guaranteed a $49.99 upgrade to the soon to be released, scriptable, MacWireFrame 5.0. Due to the overwhelming response the special price offer has been extended for a little while longer. **Special Offer:** ~~$299.00~~ **$75!!!!**



PictureCDEF 1.3 by Paradigm Software is a professional-level CDEF for creating custom graphical buttons (8-64 pixels). PictureCDEF is used in products by Adobe, ProVue, STF Technologies and others. It is multi-monitor and bit-depth sensitive. The button graphic (cicn, ResEdit) can be changed at runtime and even animated with a call-back routine. Create distinct buttons in seven variations: MultiState, PushButton, FlexiButton, ToggleButton, ChkButton, PushPictButton and TogglePictButton. Position the optional button title at left, bottom or right, or follow the system text direction for international support. Manual, sample code and MacApp 3.0 support included. Full source code: $95.00 Object code: $45.00.

HOT ITEM!

Q3S/3dPane/SmartPane source code bundle by Vivistar Consulting. Q3S: source code bundle from ViviStar Consulting. Full featured 3d graphics. Points; lines; polygons; polyhedra; Gouraud shading; z-buffering; culling; depth cueing; parallel, perspective, and stereoscopic projections; performance enhancing "OnlyQD" and "Wireframe" modes; full clipping; pipeline access; animation and model interaction support; and a "triad mouse" to map 2d mouse movement to 3d. **3dPane** provides integration with the TCL and provides a view orientation controller. **SmartPane**

SOFTWARE ENGINEERING/PROFILERS/DEBUGGERS INSTALLER TOOLS/LIBRARIES/FRAMEWORKS/DATABASES

provides TCL offscreen image buffering, flicker free animation, and QuickTime movie recording. SmartPane functions in 3d or 2d scenarios. All work with C++ compilers or ThinkC 6 and compile to PowerPC or 68K target machines. $192

Spellswell 7 1.0.4 is an award-winning, comprehensive, practical spelling checker that works in batch mode or within applications that incorporate the Apple Events Word Services protocol (e.g., Eudora, WordPerfect, Communicate!, and Fair Witness). Spellswell 7 checks for spelling errors as well as common typos like capitalization errors, spaces before punctuation, double double word errors, abbreviation errors, mixed case errors, extra spaces between words, a/an before vowel/consonant, etc... MacTech orders include developer kit with Writeswell Jr., a sample Apple Events Word Services word-processor and its source code. $74.95

StoneTable Extra: Additional functions for StoneTable. Drag selected cells within table or to other tables; optionally add rows as part of drag; popup menus or check boxes in cells; variable width grid lines; move/drag/resize table in window; clipboard operations on multiple cells. Requires StoneTable. (all prices per developer) $50 first compiler, additional compilers $25.

StoneTable: A library replacing all functions found in list manager plus: variable size columns/rows; different font, size, style, forecolor, backcolor per cell; sort, resize, move, copy, hide columns/rows; edit cells/titles in place; titles for columns/rows; multiple lines per cell; grid line pattern/color; greater than 32k data per table; up to 32k text per cell; support for balloon help and binary cell data. Versions for Think C, Think Pascal, MPW C, MPW Pascal, CodeWarrior 6 C. (all prices per developer) $150 first compiler, additional compilers $50.

StoneTable and StoneTable-Extra for PowerPC: Same functionality as 68K libraries. Versions for MPW C and CodeWarrior 6 C. Must have 68K libraries. (all prices per developer) StoneTable $100, StoneTableExtra $25.

B-Tree HELPER™ 2.2 is an inexpensive database engine for Macintosh programmers in C source code. B-Tree HELPER gets space in a file in contiguous fixed length blocks. It expands the file as necessary and contracts files when possible. B-Tree HELPER inserts and deletes keys in one or more B-Trees. It finds keys equal to, less than, or greater than a given value in a few hundredths of a second. It finds lists of records whose keys are equal to, less than, or greater than a given value or are in a range of values. $150

AppMaker makes it faster and easier todevelop the user interface for a Macintosh application. Just point and click to design your application, then AppMaker creates resources and generates excellent source code. AppMaker supports most development environments including Metrowerks, Symantec, or MPW; C, C++, or Pascal; procedural or object-oriented, using PowerPlant, TCL, or MacApp. The generated code uses the Universal Headers to provide PowerMac compatibility. Beginners use AppMaker to learn object-oriented and Macintosh Toolbox programming techniques. Experts use it to increase productivity. It saves so much time it's like having your own assistant programmer working for you. Includes one-year subscription on CD. $299

SCRIPTING/SYSTEM ADMINISTRATION

SCRIPTING/ SYSTEM ADMINISTRATION

ScriptWizard™ See page 102

FaceSpan™ v2: See page 101

DataScript DataScript is probably he quickest, easiest and most cost-effective way to make your integrated AppleScript solutions database aware-today. **Quickest:** It takes just six lines of AppleScript to make new or existing scripted solutions database aware, and fetch data from RDBM's such as Oracle, Sybase, DB2, or Informix. **Easiest:** DataScript's scripting terminology is easy to learn, easy to use, and easy to remember. "Inside DataScript" contains lots of easy to follow scripts to reuse in your own solution. **Cost Effective:** Because DataScript is so easy to learn, and use you'll become productive very quickly, and once you're ready to ship, you'll find our licensing schemes very attractive. $249.00

Scripter®: See page 101

CLImate by Orchard Software is a command line interface that lets you communicate with your Macintosh using English commands to create, delete, rename, and move files and folders. It can start applications, format disks, restart your computer, etc. CLImate supplements the Finder. It includes a BASIC interpreter that lets you script your Macintosh without AppleScript. The interpreter includes advanced programming constructs: repeat loops, if/then/else conditionals, subroutine calls, etc... CLImate implements wildcard characters, enabling you to work on groups of files. Use CLImate instead of MPW to manage your projects. CLImate is an application occupying 70K disk space. It comes bundled with sample programs and full documentation. $59.95

Cron Manager by Orchard Software implements the UNIX Cron facility. It can open any Macintosh file on a given date and time. By creating an alias, renaming it to the date and time to open, and moving it into the special Cron Events Folder, Cron Manager will open it. Cron Manager is a control panel that creates the special Cron Events Folder inside your System Folder. It is completely transparent to the user. It works like the Startup Items folder, only smarter. It works with any Macintosh file: if you can double-click to start it, Cron Manager can open it. $26.95. Cron Manager bundled with CLImate, $59.95.

Rosanne™ Rosanne is a collection of utilities which offer the user complete control over raw data. Users can sort files, extract selected records, summarize frequency counts, create sample files, perform matching on multiple files, and reformat data to new specifications, all on the desktop, and even on files of a million records or more. The Rosanne Utilities also support AppleScript™, enabling the user to link several actions together to complete an entire process. The Rosanne Utilities are recordable; users may perform a series of actions, and using an AppleScript editor such as Scripter™, see their actions translated directly into AppleScript commands. All of the utilities support multi-tasking and background processing. The Rosanne Utilities will assist you in picking your specifications, determining record length, creating output files and managing the storage of data. **Rosanne Utilities: Copy** – duplicates an input file. **Format** – creates an altered version of an input file, containing either subsets of the fields on the input file, or new fields. **Select** – creates a subset of the records on an input file based on some selection criteria. **The Recode** option allows the user to group data, or correct coding entries. **Sort** – orders an input file by a particular field or set of fields. **Match** – joins together two input files based on common values occurring in corresponding fields or sets of fields. **Aggregate** – creates an output file with summary levels. $595

ScriptBase™ The Scripting Database is a database for storing persistent objects to be made available for access to AppleScript, Apple's system-level user scripting language for controlling applications on Macintosh® computers. Once installed, the database becomes part of the AppleScript system, adding a host of commands to the basic AppleScript vocabulary. Retrieving the objects is simple using AppleScript's natural-language syntax and structure. Objects stored and retrieved in ScriptBase can be accessible any time from any script on the user's computer. These objects can be of any type, including numbers, character strings, lists, records, scripts, and references to disks, files, folders, as well as abstract raw data, to name just a few. ScriptBase can be used to maintain system-wide settings, such as sets of preferences, paths to frequently-used files or folders. Complex installations can be made easier by organizing data and scripts within the database's structure. $79

Script Debugger by Late Night Software Ltd. is a powerful and flexible AppleScript authoring tool. Script Debugger makes it simple for novice and experienced script writers to get the most from AppleScript. The program's advanced debugging environment offers single-step script execution with breakpoints. The Script Debugger dictionary browser features a graphical view of objects provided by scriptable applications. With the program, you also receive the Late Night Software Scripting Additions, a collection of more than 70 new AppleScript commands, and Scheduler, a utility that allows you to launch scripts at pre-determined times. $129

SOFTWARE FOR SALE?

List your product in MacTech Magazine's Mail Order Store.
For more information, call 805/494-9797.
Internet: marketing@xplain.com

SCRIPTING/SYSTEM ADMINISTRATION

HOT ITEM!

TCP/IP Scripting Addition™ is the latest version of an award-winning AppleScript scripting addition (first place in the 1994 "Best Hack" category in the Everyday AppleScript™ Programming Competition). This scripting addition (or osax) allows you to write scripts using MacTCP™ commands in AppleScript™. Potential uses of this include sending e-mail or files through a script, checking if users are logged on (via Finger), automating FTP, Gopher, NetNews, Telnet, and LPR, verifying links in HTML documents, and quickly writing many other TCP/IP client-server programs. Sample scripts are included already implementing many of these functions. When combined with FaceSpan, the potential for rapid implementation of Internet client-server applications is enormous. The TCP/IP Scripting Addition works with AppleScript 1.0 or later and MacTCP 2.0.4 or later. It is compatible with Open Transport™. The TCP/IP Scripting Addition can be used from Script Editor, HyperCard 2.2, MacPERL, FaceSpan and other Open Scripting Architecture applications. See "http:// www.mangotree.com/biz/mango/index.html " for more details. $49

MACTECH EXCLUSIVES/MISCELLANEOUS

MacTech Magazine is your exclusive source for these specific products including available back issues of SFA's magazine, source code disks and assorted cd's. Call for more info and pricing:

Ad Lib 2.0 The premier MacApp 3.0 compatible ViewEdit replacement. A powerful user-interface editing tool to build views for MacApp 3.0 and 3.1. Ad Lib allows subclassing of all of MacApp's view classes including adorners, behaviors, and drawing environments. String and text style resources are managed automatically. Alternate display methods, such as a view hierarchy window, allow easy examination of complex view structures. Ad Lib includes source code for MacApp extensions that are supported by the editor – buttons can be activated by keystrokes, behaviors can be attached to the application object, and general purpose behaviors can be configured to perform a number of useful functions. Run mode allows the user to try out the views as they will work in an application. Templates can be created to add additional data fields to view classes. Editing palettes provide fast and easy editing of common objects and attributes. Works with ACI's Object Master (version 2.0 and later) to navigate a project's user interface source code. $195

FrameWorks Magazine: $8/back-issue, subject to availability.

FrameWorks Source Code Disk: $10 per back issue, subject to availability.

Five Years of Objects CD-ROM: FrameWorks archives and source code from April 1991 to January 1993, plus selected object-oriented publicly available software and demos. $95

MADACON '93 CD-ROM: The highlights of MADACON '93, including Mike Potel on Pink, Bedrock, MacApp, OODLs, and more. Slides, articles, demos, audio, and QuickTime. $95

MAScript 1.2 adds support for AppleScript to your MacApp 3.0.1 and 3.1 based applications. Make your application scriptable and recordable by building on a tried and tested framework for object model support. MAScript dispatches Apple events to the appropriate objects, creates object specifiers, and makes framework objects like windows and documents scriptable and recordable. Sample application shows you how to begin adding support for scripting and recording. MAScript includes complete source code. Install MAScript by modifying one MacApp source file, then adding another to your project. Future versions of MacApp will incorporate MAScript, so MAScript support you add now will work in the future. $199

The Mjølner BETA System is a software development environment supporting object-oriented programming in the BETA programming language. BETA is uniquely expressive and orthogonal. BETA unifies just about every abstraction mechanism – including class, procedure, function, coroutine, process and exception – into the ultimate abstraction mechanism: the pattern. BETA includes: general block structure, strong typing, whole/part objects. The compiler: binary code generation, automatic garbage collection, separate compilation, interface to C, Pascal, and assembler. The system: persistent objects, basic libraries with containers classes, platform-independent GUI application frameworks on Unix, Mac and Windows NT, metaprogramming system. The tools available on Unix: the hyper structure editor supporting syntax directed editing, browsing, etc., and the source code debugger are currently being ported to the Macintosh system. The Mjølner BETA System for Macintosh requires MPW (basic set) 3.2 or later. Package containing compiler, basic libraries, persistent store, GUI framework, and comprehensive documentation. (Other packages are also available) $295

More Savvy includes all Savvy features plus Apple Event support for all sub-classes of TEventHandler with extensive view support. Apple Event support for text includes text attributes and sub-range specification. Recordability supports additional actions, and coercion includes additional types. Additional client and server Apple Events. $450

NEW Version!

Savvy 1.1 OSA support includes attachability, recordability, scriptability, coercion, in addition to script execution, idling and i/o. Apple Event support includes complex object specifiers, synchronous/asynchronous Apple Event handling, and Apple Event transactions for clients and servers. The Core Suite of Apple Event objects is supported including the application, documents, windows, and files. Documentation includes technology overview, cookbook, and sample code. $250 Savvy now supports MPW 3.1, 3.11 and continues to support 3.01, as well as supporting Metrowerks CodeWarrior. **This month only, special offer –** All Savvy versions include free copy of Savvy QuickTime!

Savvy QuickTime Requires Savvy, More Savvy, or Super Savvy. Includes QuickTime, Apple Event, and view template support. Movies come out of the box ready to play, edit, and react to Apple Events. They can be included in any view structure, including templates, and are displayed in the scrap view. Movie controls include volume, play rate, looping mode, display style, and other characteristics. $250

Super Savvy includes all More Savvy features plus compile, edit, and record scripts using built in script editor. View template editors, like Ad Lib, can attach scripts to view objects and modified scripts are saved with the document. Script action behavior allow quick access for executing and editing scripts attached to views. Text to object specifier coercion plus more. $700

MISCELLANEOUS

REM
GOSUB
LET
NS BASIC

BASIC for the Newton is BASIC for the Newton! From NS BASIC Corp-oration, it is a fully interactive implementation of the BASIC programming language. It runs entirely on the Newton – no host is required. It includes a full set of functions and data types, hand-written input, windows, buttons and extensions to take advantage of the Newton environment. Applications can create files or access the built-in soups. Applications can also access the serial port for input and output. Work directly on the Newton, or through a connected Mac/PC and keyboard. NS BASIC includes a 240 page pocket sized manual. Runs on all Newton 1.x and 2.0 units. $99

Inside CodeWarrior 7 *&* **Inside PowerPlant:** See page 101

Guide Composer™ gives anyone the ability to create powerful Apple Guide help systems for any new or existing Macintosh application. Great for commercial developers, shareware developers, in-house developers, and consultants, Guide Composer provides a WYSIWYG development environment: Guide content is developed in Guide windows. Design topics, phrases, and panels in the same format as the user will use them. Features are WYSIWYG interface, Topics, phrases, and hierarchical phrases, Coach marks, Fully-Integrated with Apple's Guide Maker (distributed with Guide Composer), compiles scripts automatically, PICTs in Panels, Generated Guide scripts are modifiable, Compiled files are 100% Apple Guide-compatible and royalty-free. Easy-to-use. $99

MachTen UNIX for Macintosh and Power Macintosh MachTen is a Berkeley UNIX that runs on the Classic to the Power Mac, including PowerBooks and Duos! So, in addition to all of the Macintosh applications, you get a Mach-based UNIX with pre-emptive multi-tasking. MachTen extends the Macintosh operating system with UNIX networking and software development tools. The Macintosh/UNIX integration is so strong that you can even use Macintosh programs and utilities on UNIX data, and UNIX programs and utilities on Macintosh files. Full internet protocol support ensures fast, easy client and server NFS, e-mail, and file transfer between the Macintosh and all TCP-based entities on your network. Built-in internet services include domain name service, POP mail service, internet routing, SLIP & PPP, and Web service. Full X11R5 support with Motif for developing X applications and a high performance X server for using your Mac as an X terminal. MachTen – Power UNIX $695. Personal MachTen (for 68K Macs) $495 . Professional MachTen (for 68K Macs) $695. MachTen X Window Software $350.

Roaster DR1™ See page 100

Geekware by Metrowerks

Mousepad	$8.95
Geekware Hawaiian Classic	$7.95
Blood, Sweat & Code Black Long Sleeve Shirt	$14.95
Cross Platform White Short Sleeve Shirt	$14.95

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TIPS & TIDBITS

By Steve Sisak, Contributing Editor

TIP OF THE MONTH

Here is a handy function for making sure that an undeletable "file from hell" doesn't get in the way during program execution, just move it to the Trash. This only works when the file is on the same volume as the Trash, however.

Greg Poole

File: FSpTrashFile.h

```
/***************************************************************************
   FSpTrashFile.h

   history:
      modified:   xx/xx/xx      who are you? what did you do?
      created:    11/23/94      greg poole

   Greg Poole
   Vital Images, Inc.
   email: greg@vitalimages.com

***************************************************************************/

#pragma once

#ifdef __cplusplus
  extern "C" {
#endif
  extern OSErr FSpTrashFile( FSSpecPtr file );
#ifdef __cplusplus
  }
#endif
```

File: FSpTrashFile.c

```
/***************************************************************************
   Move a file to the trash if it is not possible to delete it.
   Can only move file to the trash if it is on the same volume
   as the file to be deleted.
***************************************************************************/

#include <Folders.h>
#include "FSpTrashFile.h"

OSErr FSpTrashFile( FSSpecPtr theFile )
{
  OSErr       theErr = noErr;
  short       vRefNum;
  long        dirID;
  FSSpec      spec;
  FSSpecPtr   theTrash = &spec;

  // don't go any further if there isn't a file to deal with or if the
  // file was deleted successfully
  //
  theErr = FSpDelete( theFile );
  if ( theErr == fnfErr || theErr == noErr )
    return noErr;

  // if we got this far, we had a problem deleting the file,
  // don't worry, relax and just trash it
  theErr = FindFolder( kOnSystemDisk, kTrashFolderType,
                  kDontCreateFolder, &vRefNum, &dirID );

  if ( theErr == noErr )
    theErr = FSMakeFSSpec( vRefNum, dirID, "\p", theTrash );

  if ( theErr == noErr )
    if ( theFile->vRefNum != theTrash->vRefNum )
      theErr = diffVolErr;

  if ( theErr == noErr )
    theErr = CatMove( theFile->vRefNum, theFile->parID,
        theFile->name, theTrash->parID, theTrash->name );

  return theErr;

} // end FSpTrashFile

// define TEST_TRASH_FILE for a standalone test
#define TEST_TRASH_FILE

#if defined( TEST_TRASH_FILE )

  // local function prototypes
  static void     InitTheMac( void );
  static Boolean  GetAFile( FSSpecPtr file );

  static void InitTheMac( void )
  {
```

Continued on page 95

*Send us your tips or we'll install EvenBetterBusError on your machine! On the other hand, we might just pay you **$25** for each tip we use, or **$50** for Tip of the Month. You can take your award in goods, subscriptions or US$. Make sure any code compiles, and send tips (and where to mail your winnings) to our **new Tips e-mail address** at tips@mactech.com. See page two for our other addresses.*

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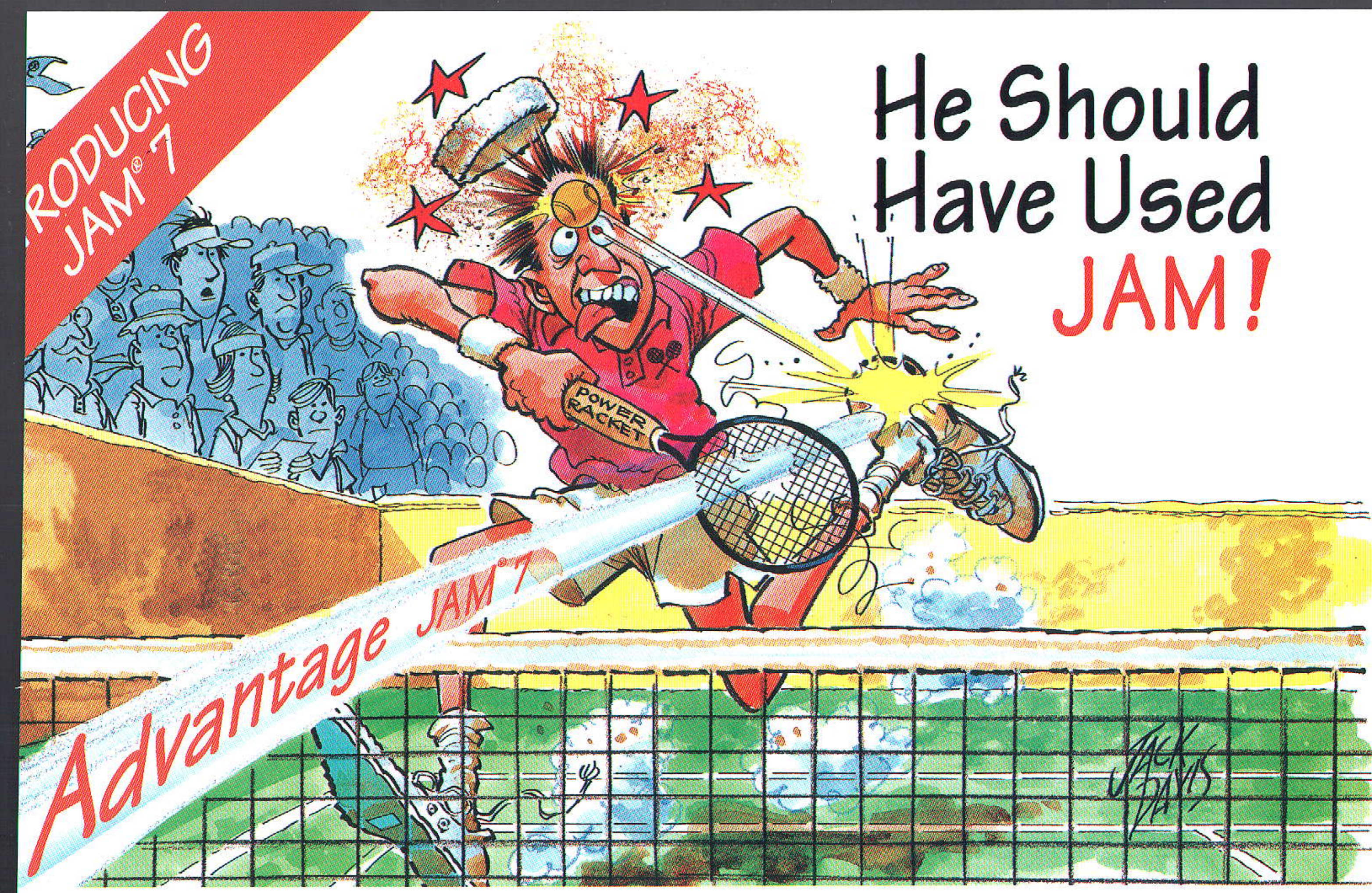

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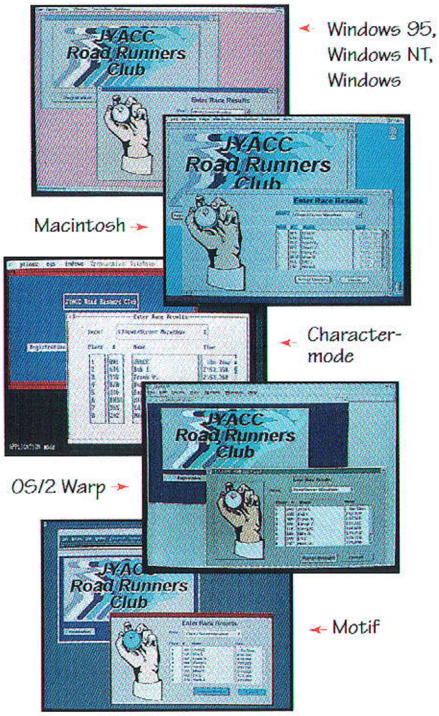

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